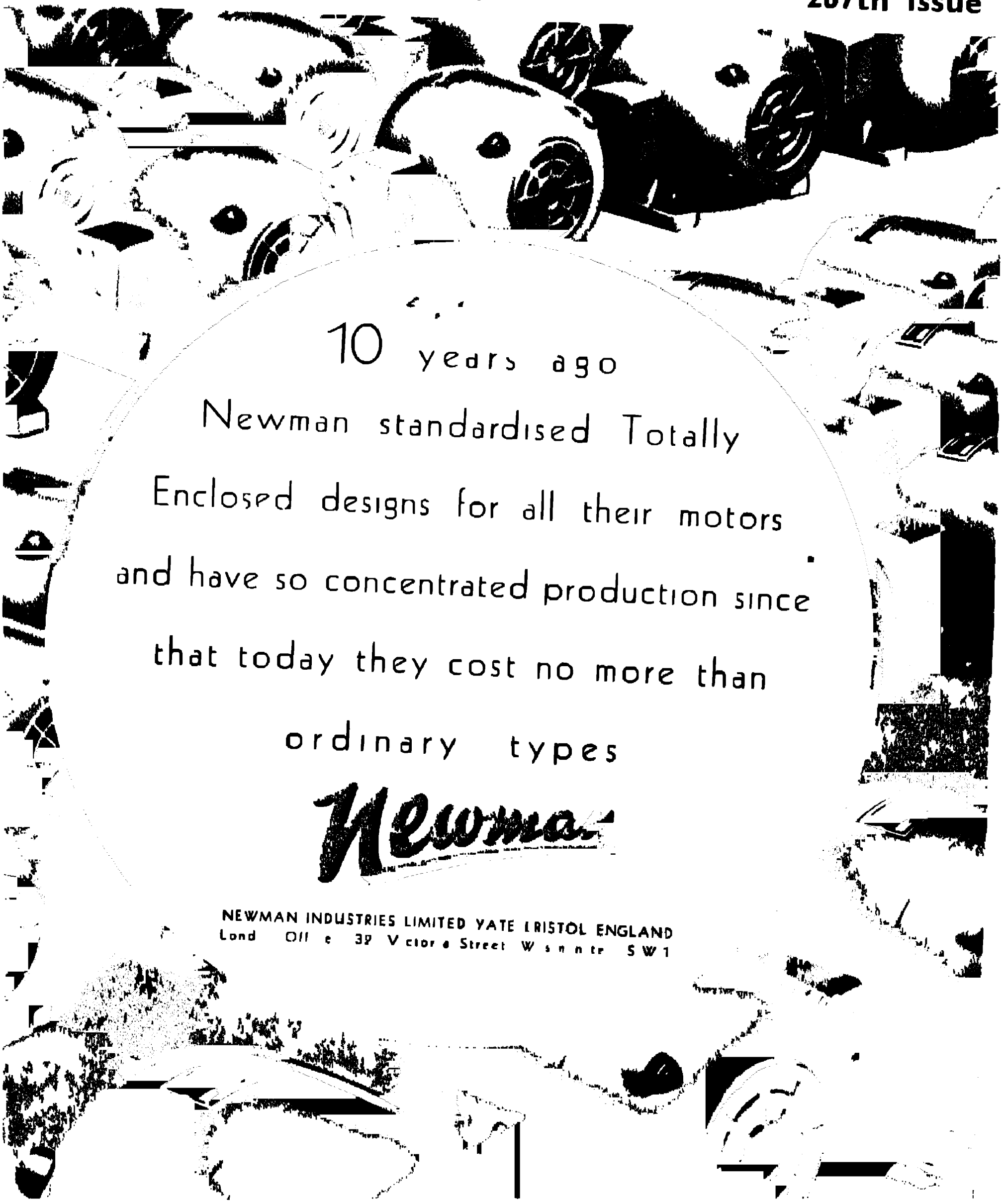
Mass Production

Industrial Power and Mass Production

- per annum posted

JANUARY, 1948

267th Issue



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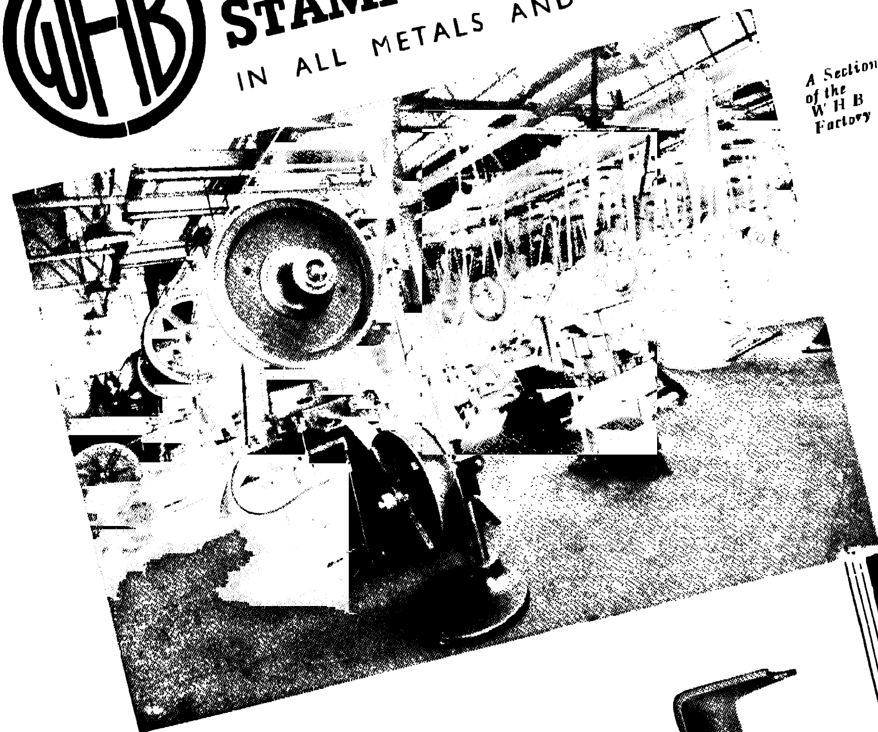

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From. B.E.H.

To. Man. Dir.

Continued.

7.7.47

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9.7.47

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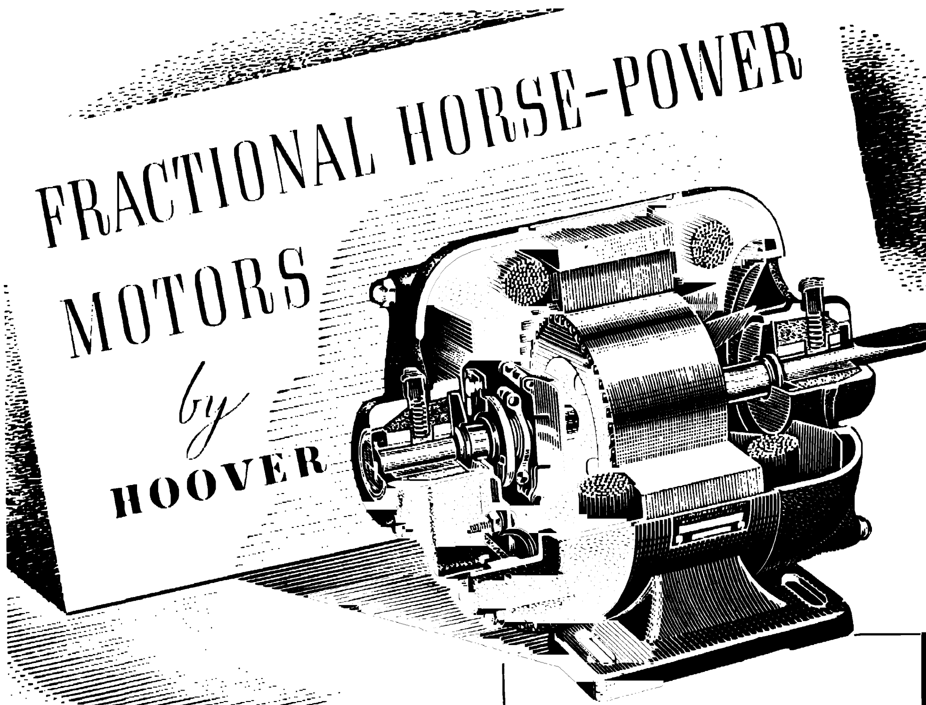
M.



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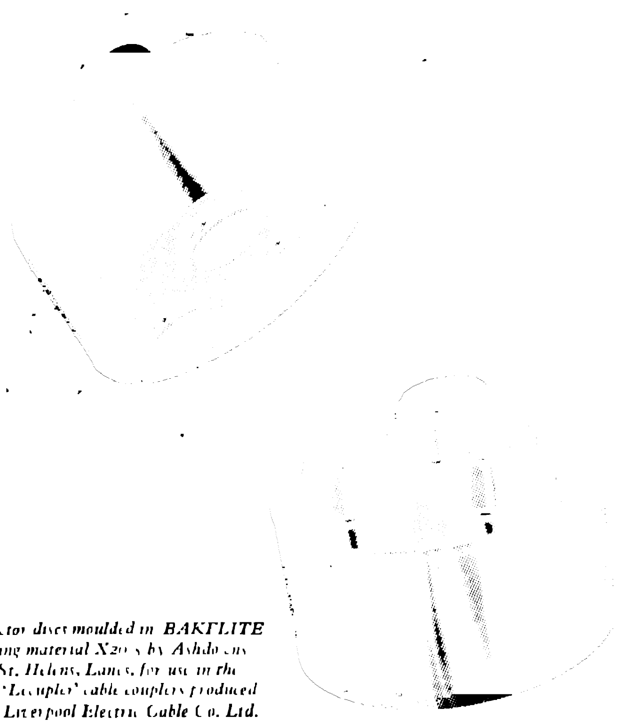

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T.121

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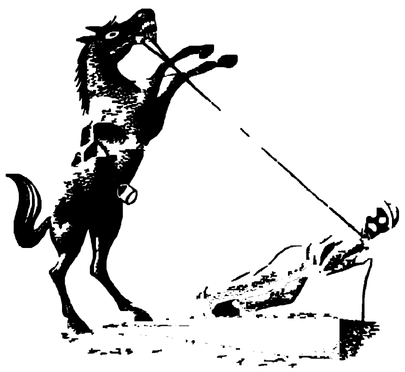

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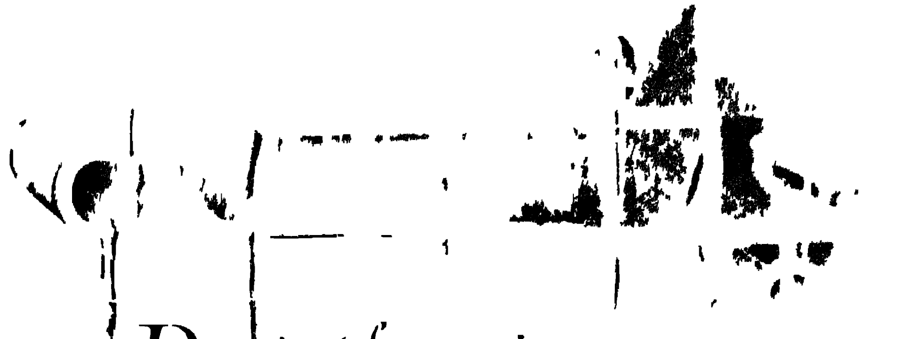

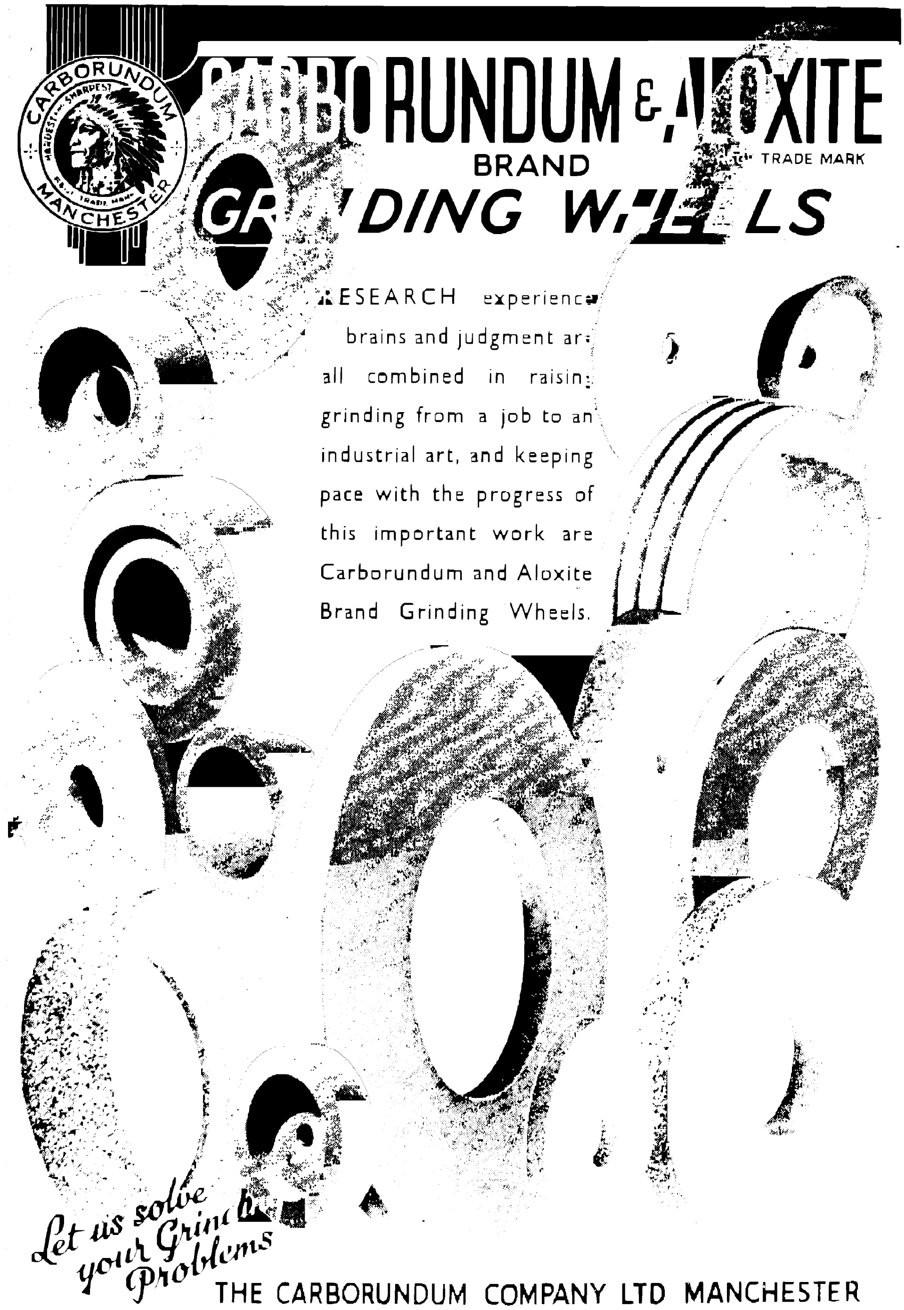
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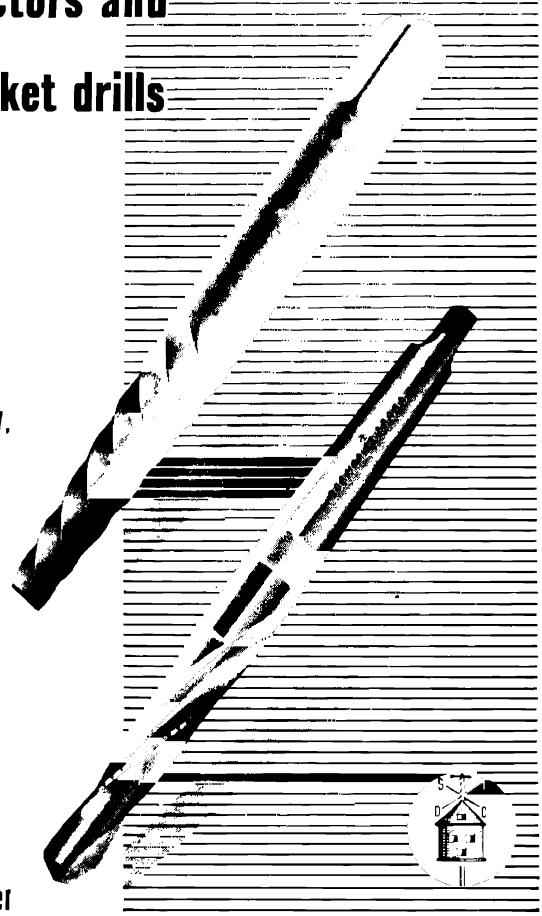

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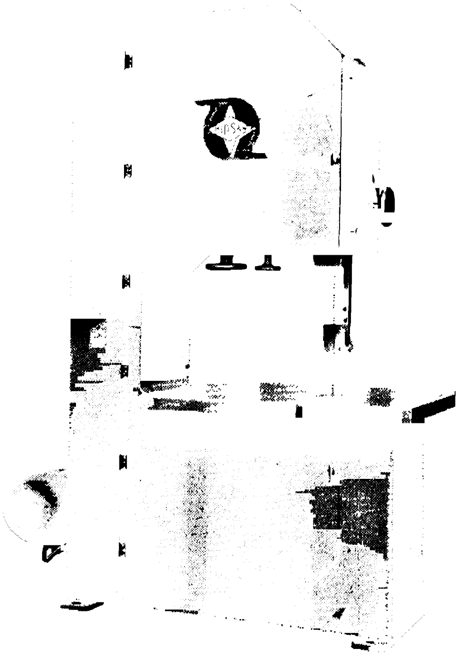

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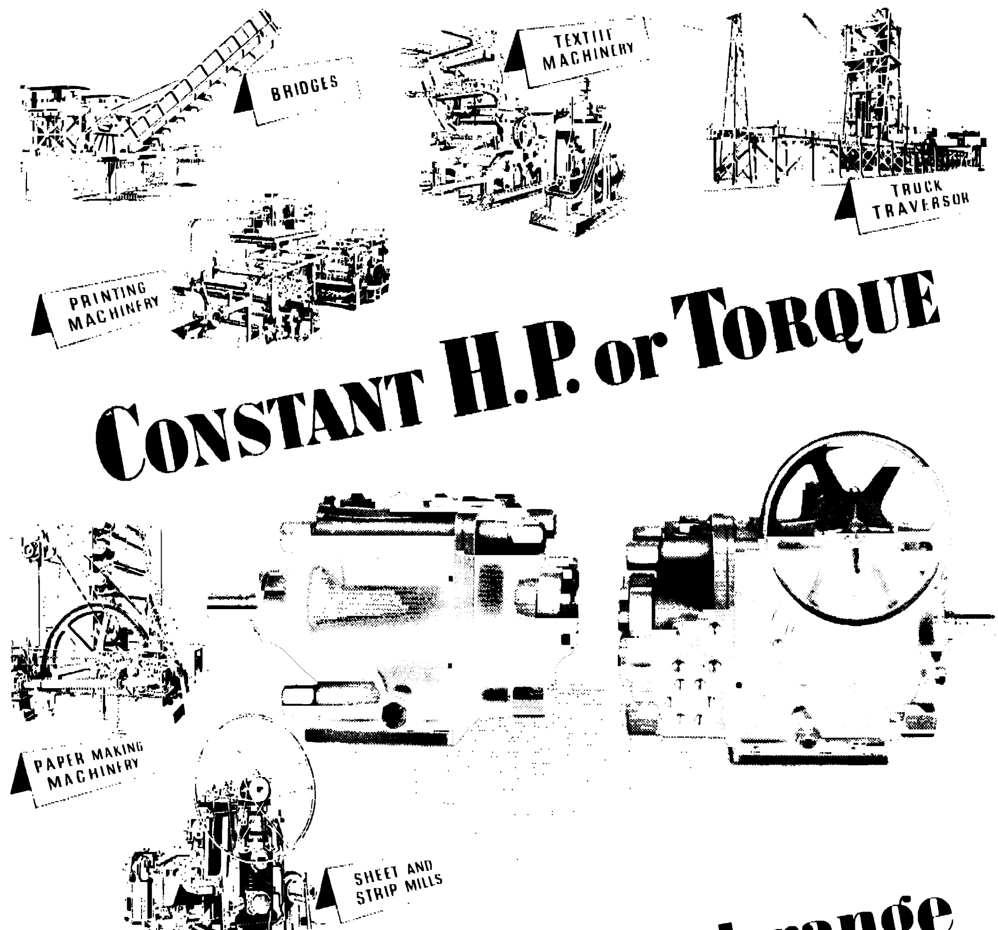

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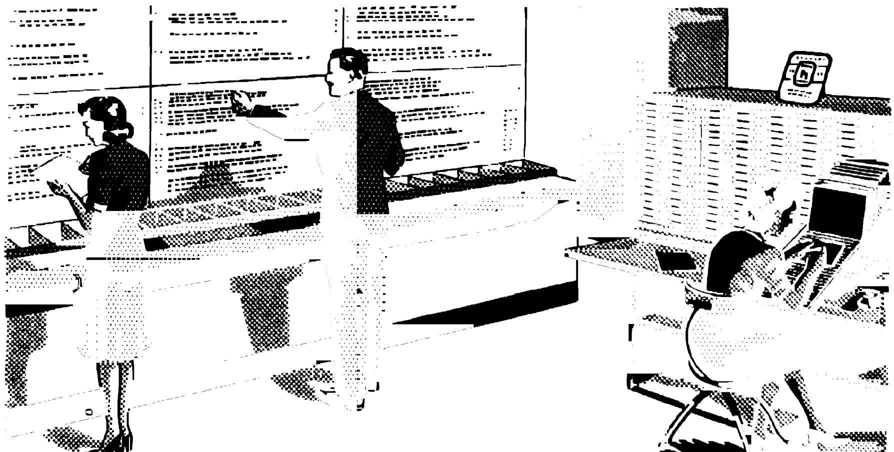

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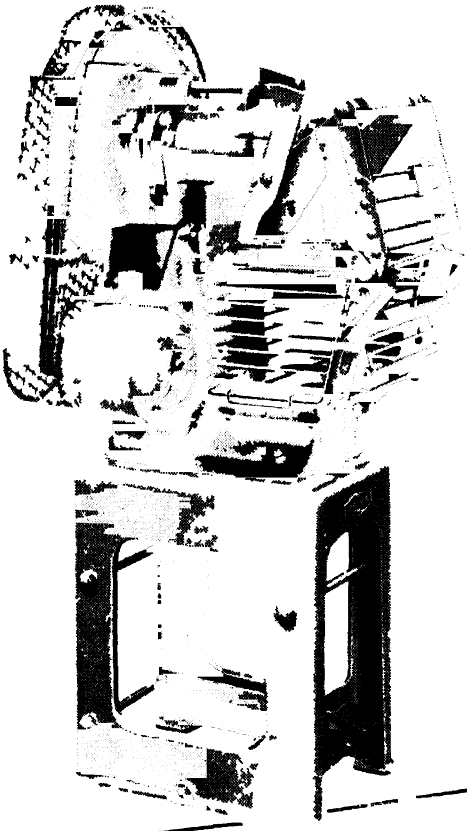

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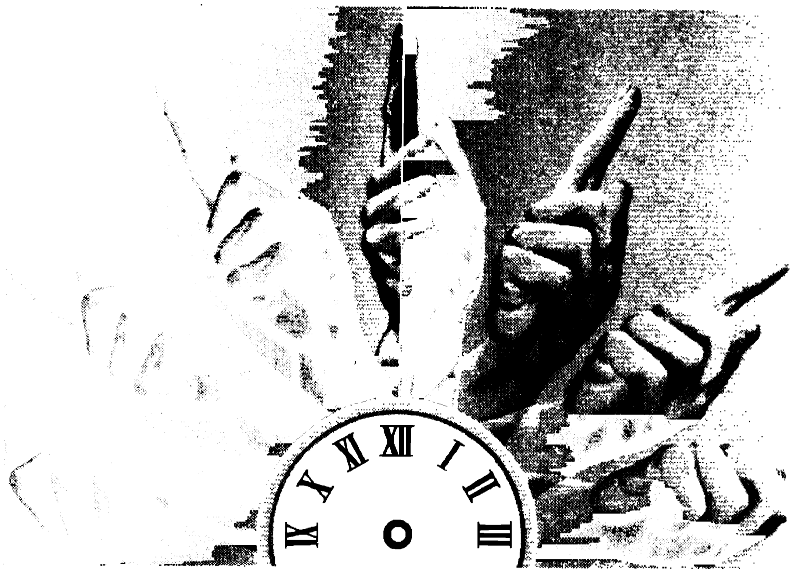

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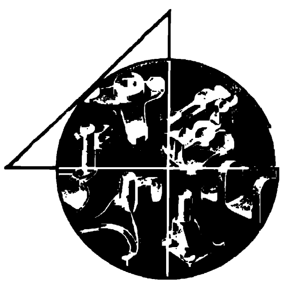
The slogan "Do it now," aiming to ensure instancy in action is actually a sheer anachronism to those who really THINK. Obviously, every action, however seemingly instantaneous, must occupy a fractional area of Time, in which Past and Future meet, but are never really combined into a "NOW"-entity.

Even in the few moments taken by some statistician to write the words "The population of the World is . . . . . . ," countless numbers of babies are born and innumerable people die.

As a quantum, the Present doesn't exist.

★ ★ ★



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"*For all the past, read true, is prophecy*"

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Mass Production

IN THIS ISSUE

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Mass Production

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NEW YEAR RESOLUTION—TELL THEM THE FACTS.

WE may not all of us agree with what our Government has done in the past twelve months. But one thing they have made quite clear is that we must have more production. In a speech in the House recently the Prime Minister said :—" We need not only better balanced production, but more production, and we must have it quickly ; as an emergency measure, we must ask for longer hours of work." There will be few who doubt the sincerity of this Governmental appeal for help ; few who would be unwilling to do their share. The question many people ask is " what can we do ? "

A few weeks ago Mr. Jack Jones, Joint Parliamentary Secretary to the Ministry of Supply, told a meeting of iron workers " Forget the idea that if you produce an extra ton the boss will profit—the Chancellor will look after that." The advice is sound. The theme that a worker's labour profits only his boss has been so often plugged by the political agitator that there is now, throughout the country, a general feeling of hostility to both management and trade unionism. It is reflected in the recurrent wave of unofficial strikes which have cost us dearly in production. The Chancellor of the Exchequer has, as Mr. Jones said, " looked after " profits. In his interim budget he has obliterated excessive profit. Yet the feeling that somewhere, somehow, someone is making illegitimate gain at the nation's expense remains.

This may be true of the spiv. It is to-day untrue of industry. It is therefore incumbent upon the industrialist to help the Government in its task of restoring peaceful industrial relations by providing employees with proof of the effectiveness of the Chancellor's measures. The worker is normally suspicious of the motives and activities of the management, of which he usually knows little except through shop rumours. His attitude in nine cases out of ten is :—" I'll work as long as I get a square deal. I don't mind working if I know it's for the public benefit, but I'm damned if I'm going to work hard to make " them " into millionaires—or to see chaps with half my ability earning twice my wages." He may be humbugging himself in thinking this ; his ideas on a square deal may be a trifle vague ; and people engaged in industries

run for the public benefit, such as the postal service and the naval dockyards and arsenals, don't work conspicuously harder than other people. But still, that's his reaction !

Public opinion nowadays is, to all intents and purposes, unanimous that there is no such intrinsic difference in value between one human being and another as is represented by the difference in power and living conditions of a Vanderbilt and those of a slum dweller. A certain levelling up of incomes in this country has been recognised as not merely unavoidable but just. And this means that in order to ensure the continuance of incentive, whatever may be the ultimate organisation of industry, some immediate practical step must be taken to assure men that they are getting a square deal—to satisfy this queer and, in a sense, pathetic mixture of idealism and self-interest, the question again is " what can we do ? "

This is what we can and must do : Give the workers the facts ! Set out balance sheets—simply—on works notice-boards. Publish these facts and balance sheets in works magazines. Tell how much goes in wages, how much in tax, stock, overheads, machinery. Destroy for always, the pernicious notion that huge profits are being made out of the many by the few. Some firms have already done this. Workers of the Metal Box Company or Vauxhall Motors, for example, know precisely how the profits are made—and spent. Other industrialists should follow this lead and put their employees fairly into the financial picture. In America it is common practice. British industry should adopt a similar scheme at once.

Strikers—and those who neglect means of averting strikes—jeopardise more than a firm's future. They imperil the whole economic structure of the country. If the Chancellor loses essential revenue, derived from the profit-tax, schemes for social reform and improvements in standard of living collapse. The Exchequer is entirely dependent upon a healthy, productive industry for its revenue.

Break-down of balance sheets removes the grievance of excessive profit-taking and enables employees to read the facts for themselves. Here is a golden opportunity for free enterprise to show its initiative in another field. It should not be neglected.

AMERICAN AND CANADIAN VIEWS.

According to information reaching London, Mr. John Snyder, President Truman's Treasury chief, is determined not to give direct aid to Britain outside the Marshall Plan unless he gets an answer to the question : " Is Britain under Socialism still going to be a solvent concern ? "

Meanwhile, there are signs that America's individual citizens are anxious to help Britain with private loans or other forms of aid. Mark Sullivan, Washington's top political columnist says they will not do this, however, while they fear that the Socialists will take over industry.

In Canada also there are marked signs of sympathy for Britain. The Winnipeg Free Press says the real test when you help a neighbour is not how much you give, but how much you have left. It adds that it doubts if American industry would be efficient " if we got up on a winter's morning in a cold house, with the electricity turned off, ate a wretched breakfast, came home exhausted to a dinner of steamed sole (84 calories), five ounces of boiled potatoes (115 calories), a hunk of bread (72 calories) . . . and then sat down beside an empty fireplace, listening to Mr. Attlee pleading for everyone to work harder to-morrow."

Current co[illegible] ng industry

TRENDS

THE inescapable economic positi[illegible] the manifold panaceas promoted to galvanise virility into it, obtrude thems[illegible] the debut of the New Year.

There is some modest ground for encouragement in several directions. Bright rifts are seen in the clouds. As our trade and export drives gather momentum, the monthly returns will be anxiously examined to assess progress towards the ambitious but necessary targets which have been set for 1948. Certain it is that there could be no hope of emerging from our balance of payments difficulties if matters were left to chance. As everyone knows the crux of the problem is not the adverse balance as a whole but the balance with hard currency areas. We are facing up courageously to our problems.

The interwoven spheres of economics and finance have been entrusted to a single Minister who has set a pointer to economic realism and voices satisfaction with our fiscal position which he contends is moving in the direction of sound National finance.

The effect of the interim Budget in November last has yet to be felt ; its main purpose was to contain the inflationary pressure by the expansion in exports and the limitation of imports. While the Chancellor shrunk from administering a really hefty dose of inflationary medicine, he grasped the nettle, and the new impositions well carried out, will help our return to solvency.

A solvent Britain, as the Harriman committee mentioned in connection with the American aid plan, is essential to Europe, to the United States—and to the world.

Industrial Research

Research is all the rage. Great Britain's survival and future prosperity, it is frequently claimed, depend on the technological advances it can make. The Government have given their blessing to an increased flow of Scientists from Universities who will either add to fundamental knowledge or assist in the application of that knowledge to industry. Technical schools are to be increased and public money on a modest, yet much more generous scale than before the war, has been provided for medical, agricultural and other research.

Industry is urged to fall in with this new spirit but hitherto the facts about the extent to which it was doing so have been unknown. The Federation of British Industries has therefore to be congratulated on its attempt to assist statistically the quantity of scientific and technical research being carried out by British industry in its own laboratories and works at the present time.

From figures published it is judged that some £30 millions a year is being spent by industry (private enterprise) on its own research. This sum is a great improvement on pre-war ; in 1938 the figure was only £5,442,000, while to go back to 1930, it was a mere £1,736,000. America is spending on industrial research a very large figure, while our own Government's expenditure on research for the year 1947-48 is estimated at £67 million, of which £60 million is for defence services and the rest for civil purposes.

The proportions of time and peaceworkers in manufacturing industry differ greatly. Both sides of industry have declared their readiness to co-operate with the Government in extending systems of payment by result in order to secure increased output, and more factual information about the adoption in practice of piecework systems is, for this reason alone, particularly valuable especially if it can be published at regular intervals.

The proportion of workers on piece rates varies widely from industry to industry. Of the 5,750,000 workers covered by the last official survey, pieceworkers accounted for 26 per cent. The proportion of women employed on piece rates is considerably higher than for men.

In the range of engineering and general manufacturing industries the proportion of pieceworkers is fairly high. In the metal, engineering and shipbuilding group as a whole, no less than 46 per cent, of the men are working on piece rates, while in a few individual industries, including iron and steel manufacture, electrical engineering and motor vehicle production, the proportion is over 50%.

Such industries as transport and public utilities do not lend themselves easily to systems of payment by results, but the agreement reached in the building industry last year should lead to a larger increase in its present negligible proportion which, according to the last return, was only about 3 per cent.

In the Textile group 43 per cent, are pieceworkers and the proportion of women pieceworkers is as high as 58 per cent.

The fact that in all the industries surveyed, an average of only one-quarter of the workers are on piece rates cannot be regarded as satisfactory at a time when the most rapid and effective incentives to increase output are needed. It would certainly be an advantage if the representatives of each industry could examine their methods of wage payments to see how far in practice systems of payment by result can be extended.

News and views of men who lead the

Export trade is a delicate plant

MR. WALTER LINES, Chairman and Joint Managing Director of Lines Bros. Limited :—

It is obvious that neither we nor anyone else can export goods unless overseas customers are willing to buy. This is fundamental and involves problems far too involved to be successfully tackled without the necessary experience and the ability to produce and market suitable goods.

The Government will do well to trust those concerns which have proved, over a long period of years, their ability to export. Export trade is a delicate plant which will thrive only if cultivated by experts ; the encouragement Government can give is obvious and welcome, but unskilled hothouse forcing treatment will tend to wither and kill it.

Shortage of material is the main difficulty —steel and textiles and, not least, absence of sufficient and suitable paper and cardboard to make those attractive cartons and boxes which are such a feature of the modern world. Poor packages are a bad advertisement for the goods inside.

Alarm at the cost of coal

MR. CLAUDE E. PEASE, Chairman of Horden Collieries Limited :—

I think everybody must be alarmed at the rapidly rising cost of coal. Foreign buyers in those markets which are in competition with us are already complaining of the very high cost of the goods we supply. There is no single factor which leads to this high cost more than that of the price of coal. The men are continually being told that quantity is what matters and not cost, but I think our outlook for the future is very dark and that the miners and the whole population of the country will receive a great shock unless the cost of fuel can be controlled better than it is to-day. Unless some check can be put upon this cost there does not seem much chance of our reaching the quantity of exports that are so vital to the country to-day.

The miner has always been averse to the introduction of machinery, and the reason for this to me is very easy to understand—namely, that in the past machinery spelt to him a reduction in the number of men employed and, therefore, unemployment, from which he has suffered so grievously. On the other hand, the present high wages can only continue to be paid of the output per man employed is increased by a very substantial margin.

No prosperity by nationalisation

MR. HENRY C. CLARK, J.P., Chairman of Foster Clark Limited :—

I and my fellow directors regard with concern the very high rate of taxation. This year in our case it amounts to £72,000. Had the recent increase in profits tax applied for the whole year, taxation would have been higher. Where a company's capital is all in ordinary shares, if the whole profit is distributed, Income Tax and Profits Tax would amount to 11/9 in the pound. If half of the profit was needed for payment of dividends upon preference shares, the rate of tax on the profit paid to the ordinary shareholders is equivalent to no less than 14/6 in the pound. It is quite indefensible to make the profits tax apply from January 1st last.

While there is a case, in the present economic crisis, for a reasonable profits tax temporarily, in principal it is a bad tax because it falls upon the holder of ordinary shares and so acts as a deterrent on business enterprise, which is more than ever essential in the National interest at this time. The Government should resolutely reduce its expenditure.

With the increased cost of living, it is generally recognised that it is quite right for salaries and wages to be increased from what they were, but a fallacious doctrine is widely preached that it is quite wrong for the man who by enterprise, hard work and thrift, has saved money, to get any increase in income from his investments in order to partly meet the increased cost of living and as some compensation for the decreased value of the pound sterling.

I believe this attitude to be fundamentally and economically wrong and against the National interest. It is often forgotten that the greatness and prosperity of this country has been built up by the enterprise and hard work of far-seeing men who were prepared to risk any money they had, knowing quite well that they might lose it, as they often did.

Chairman

The production of goods needs the following essentials. The provision of factories equipped with plant and machinery, working capital and raw materials brought in ships and by rail from all parts of the world. All these things are provided by the investors. Other requirements are skilled and considerate management and an adequate and contented labour force. These things are indispensable to each other to obtain best results for all, so each needs encouragment and reward.

The incentive to workers could wisely be increased, but, on the contrary, much is being done to discourage the enterprise of managements and business men upon which so much depends.

From political, as distinct from economic reasons, a strictly limited amount of nationalisation was probably inevitable, but it should be remembered that no country has ever become prosperous by nationalisation. Under private enterprise, if a business is conducted inefficiently it becomes bankrupt and gives way to a more progressive one. Where a state monopoly is inefficient it simply puts up its charges to the public, and the community suffers and has no redress.

The same dog with a different collar

Sir Montague Burton, LL.D., J.P., Chairman and Managing Director of Montague Burton Limited :—

I venture to submit that, during the present crucial march of events, political differences and divisions should be submerged. There is a risk that internal dissensions may delay victory in the "Battle of Production." A swing towards the extreme left or extreme right might imperil those ideals to preserve which so great a price was paid so recently. A sorely tried people is susceptible to snatch at specious remedies, which may lead to the concentration camp or the iron curtain. A well-known novelist aptly described the two ideologies as "The same dog with a different collar." They are both equally dreaded by 99 per cent. of the three political parties. One hesitates to express views which may be interpreted to be the introduction of politics to a business meeting, but in view of my association for nearly half a century with an organization which—public utilities and combines excepted—is among the 12 largest employers of labour in the country, and my recent investigation of ndustrial conditions in the United States and Canada, I feel I should be failing in my duty if I did not emphasize that the alternative to the middle path may be strife, starvation, and serfdom.

As far as our particular trade is concerned, the prospects fall into the two categories of short term and long term. The former is dark, drab, and gloomy ; cloth is scarce, trimmings in short supply. There is a liability to execute orders which have accumulated because of curtailment of supplies. It is a glorious time for the pessimist and the prophet of depression and despondency. The long term outlook has never been brighter: there is work for all ; Obligatory Industrial Arbitration is favoured in influential quarters. Men have never been more quality-conscious, more style-conscious, more dress-conscious. When we emerge from the effects of the aftermath of the most formidable struggle in the history of man, and the mills in Yorkshire, Lancashire, Scotland and elsewhere once again are in full operation, quality, style, service, enterprise, and efficiency will reap their due reward.

Wearing of the hair shirt

Mr. Alan V. Sugden, Chairman of The Wallpaper Manufacturers Limited :—

The figure resulting from the cuts in supplies of paper for the home trade is 29% in weight of consumption in 1939. No account is taken of the arrears accumulated during the five years in which wallpaper was not produced, nor of the increased demand for the article, which has resulted from a higher standard of living in working-class homes consequent upon higher wages.

Considering that home morale is very much dependent on cleanliness, a point recognized by one Ministry at least by directing us to divert a proportion of our output to mining villages, it does not appear that the Government has any clear understanding of the psychology of the inhabitants of this island or perhaps favours dirt for its relation to austerity and the wearing of the hair shirt.

The anticipated decline in our wallpaper interest emphasizes the wisdom of the board over the last decade and more in spreading risks and widening the scope of remunerative development in other directions. It is to these other interests that we now look with some confidence to make good the mutilation inflicted upon wallpaper manufacture.

SUGAR processing

The bulk processing of sugar, one of the prime necessities of life, is the subject of this series of photographs taken at the Thames-side plant of Tate and Lyle. The photographs show each stage of the process from the incoming sacks on the barge to the packet of cube sugar leaving the packing machine.

SUGAR is in the news . . . . and it's shortage again, the old, familiar story that Britain now is growing well used to. Speaking recently at Kingstown, Jamaica, Lord Lyle, biggest name in sugar stated that the British domestic ration was in danger, owing to the lost production in factories shut down by labour troubles. At the time he spoke, 12 of Jamaica's 26 sugar factories were grinding cane ; the rest were picketed by strikers.

Though to-day, the position is better, the day when the vast Tate and Lyle refining plant on the Thames will be working to full capacity is remote. Capable of producing 5,940 tons of refined sugar a day, the plant is coping with a mere fraction of this sum—and still keeping up exports.

For Britain exports sugar, too, 160,000 tons of it in 1946, against 362,000 tons in 1938. But it's not British sugar. The raw syrup is refined for countries not equipped to do their own sugar processing.

The sugar comes as a syrup from the West Indies. Syrup is rich and yields a high sugar content—roughly 95% is used. In season, English beet is used, and no difference can be detected in the finished product. An average annual output from the refinery shows that beet makes up 15% of our sugar.

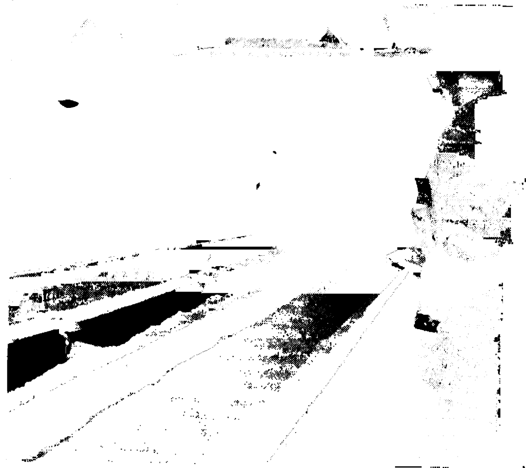
In the palmy days of peace, when everything was a little sweeter, Britons consumed 1,070,000 tons of sugar a year. That is the figure for 1937 and 1938. To-day, the domestic ration of half a pound each a week has reduced the figure to about half a million tons a year.

The photographs on the following pages show, stage by stage, the processing of sugar in quantity at this huge British refinery. The process is the same for granulated or cube sugar up to the point where the sacks are seen to be weighed and sealed but cube sugar goes through further processing in order to put it into the condition in which we know it Photographs are by Chris Ware, one of Keystone's premier feature photographers.

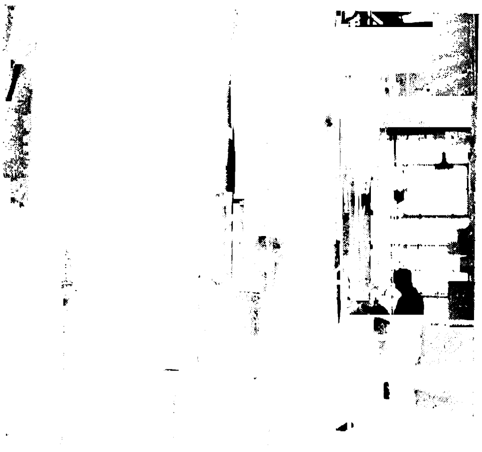
1.—Stacked on the landing, the sacks of raw sugar are wheeled away by hand truck to the refinery.

2.—Bags are placed on the scales in drafts of four or five according to size and country of origin [e.g. Jamaica, Trinidad, Etc.]

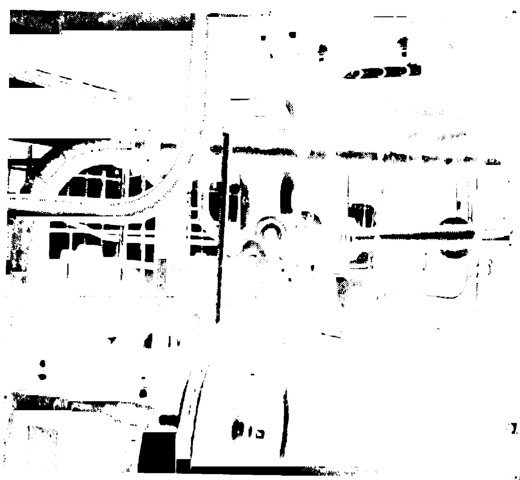
5.—After weighing and sampling, bags are emptied into large silos under the landing floor. 10,000 tons can be stored.



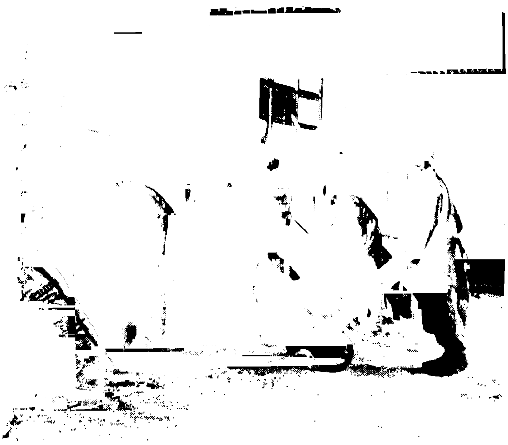
6.—Raw sugar leaves the silos on an endless steel band for the first stage of processing.



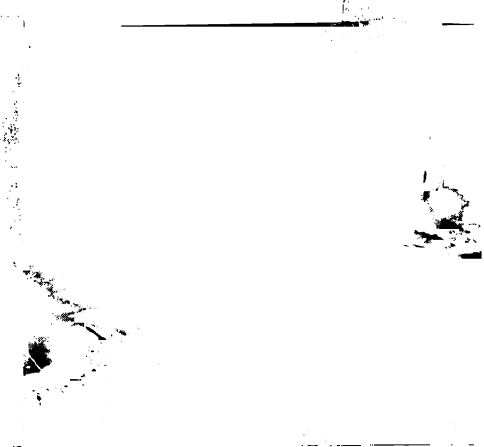
9.—Large vats in which sugar solution is treated with milk of lime, the carbonatation process.



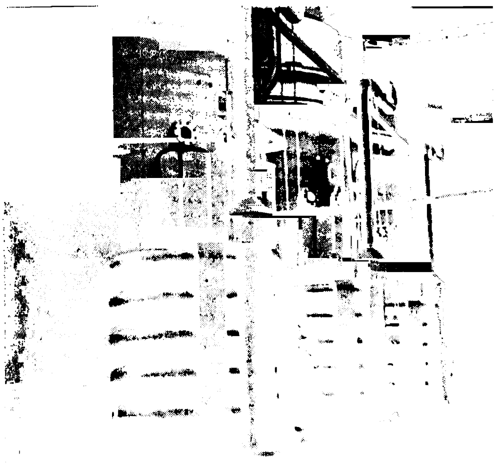
10.—Control valves and pipes. Carbon dioxide gas bubbles through the sugar carrying with it impurities.



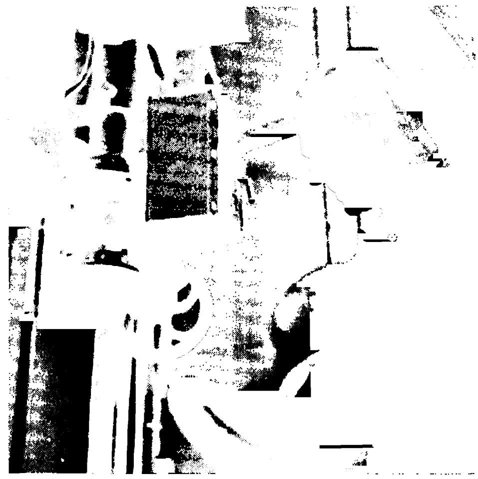
3.—A sample of sugar is taken from each bag for analysis by buyer, seller and H.M. Customs.



4.—There is room for 40,000 tons of raw sugar in the store. None of this sugar has yet been processed.



7.—Vacuum pans for boiling cube sugar, each of a capacity of 1,000 cubic feet. Each is heated by five steam coils.



8.—A pansman at the controls. The instrument in front of him is the indicator for the vacuum valve setting machinery.

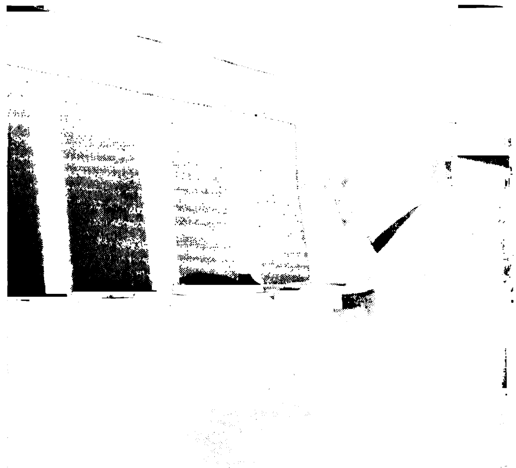
11.—Testing to determine that the process has been completed before passing to the filter seen in the next photograph.

12.—The filter receives the cloudy liquor and clarifies it during passage under pressure through a series of filter cloths

13.—The massecuite from the pan is run into a heated receiver, before transfer to a mould. Temperature at this point is still above the boiling point of water.

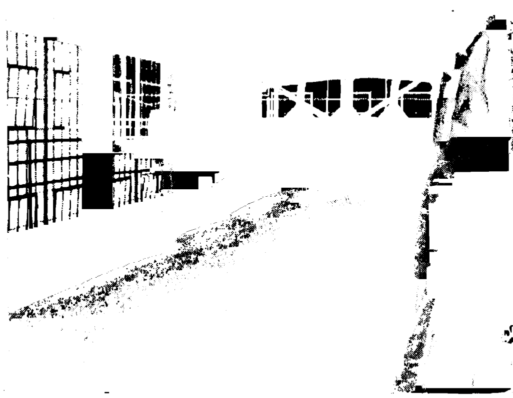
14.—Operator has just pressed a button automatically releasing 2 cwts. of sugar, electrically weighed. His left hand is on a quick-release device which drops the sack.

17.—Endless conveyor carrying tops of sugar moulds through a trough of hot water to clean them before re-use.



18.—Dried and cooled into slabs, the sugar is examined by the departmental foreman prior to being cut into cubes.

21.—The cutting machines. Diced cubes come bouncing onto the meshes to fall onto the conveyor taking them to be packed.



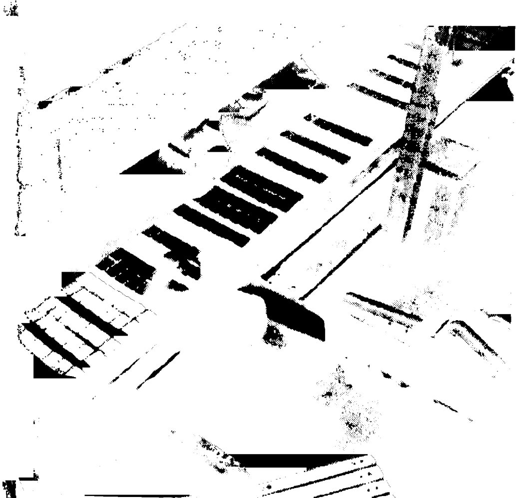
22.—This picture shows about 50 tons of cube sugar being moved by conveyor after being discharged from the cutters.

15.—Here we have reached the last stage in processing granulated sugar, a two hundredweight bag is hemstitched by machine after being weighed.

16.—The conveyor carries moulds of sugar to drying stores. Each mould contains about 7 cwt. of sugar, and passes the inspector at the rate of one a minute.

19.—Air conditioned drying stores have racks for sugar slabs. Foreman is moving slabs for examination before the cutting.

20.—The end of a slab: on the cutting machine, the sugar is diced into the finished cubes. It now goes to the packers.



3.—This machine prints the carton, glues it, forms it, fills it with sugar at the

24.—Packeted sugar in 2 lb. cartons being discharged off the automatic packing

JOTTINGS

A LARGE NUMBER OF MULTI-spindle drills in which all drilling spindles have fixed centres, is available for sale at various Government Surplus Store Depots. It is pointed out that in most cases, these machines can be adapted to meet particular requirements by the fitting of new drill spindle heads. Specifications, prices and location of individual machines are fully set out in the records of the various disposal centres which are as follows: Birmingham—C.M.L. Buildings, Great Charles Street, Bristol—8-9 Elmdale Road, Cardiff—Imperial Buildings, Mount Stuart Square; Glasgow—21, Glassford Street, C.1.; Leeds—10, Bank Street, off Boar Lane; London—Room 0088, Thames House North, Millbank, S.W.1; Manchester—Britannia House, Fountain Street.

THE LORD PRESIDENT OF THE Council of the Department of Scientific and Industrial Research, has decided that the new Mechanical Engineering Research Station, which is being set up by them, will be sited in Scotland. In addition, sub-stations for fuel research, are also to be established in Scotland by the D.S.I.R.

THE SOCIETY OF INVENTORS, Chamber of Commerce Buildings, 1, Old Hall Street, Liverpool, 3, give particulars of the aims and objects, membership, advantages, and rules of the Society. In a new brochure recently issued in addition to Liverpool, there are now branches in Manchester, Birmingham, London and N.E. England.

THE BOARD OF TRADE ANNOUNCE that the address of the Directorate of Mica is now:—23, Buckingham Gate, Westminster, London, S.W.1. (Telephone, Victoria 7503).

THE 136,373 BICYCLES EXPORTED during October has beaten September's all-time record (129,578). India got 44,440 of them; South Africa 16,096; British Malaya 7,626; the Argentine 5,396 and U.S.A. 2,388. The total value of bicyles and motor cycles exported for the first ten months of the year is £11,632,600.

MR. HUGH GAITSKELL, MINISTER of Fuel and Power, has rejected a plan for cheap, mass-produced oil-heaters to save domestic coal and ease the electricity load during cold spells, as the marketing of more oil-heaters is not practicable because of the shortage of kerosene.

FACTORIES NOW IN PRODUCTION on the Hartlepools Trading Estate are, we understand, employing about 60 men and 790 women. When all the factories scheduled for the estate are erected and in full production, these figures will be increased to 1,700 men and 3,400 women.

AN OFFER TO WORK AN EXTRA hour per shift was made by about 75 employees of both sexes at Jarrow Tube Works. They offer to do this until March next year to help production. The extra shift will be on Sundays and will enable the firm to fulfil its commitments for roller bearing tubing.

IT IS ANNOUNCED THAT OVERSEAS orders for British cycles to the value of over three million pounds sterling were taken during the Raleigh Industries Fair, which was held at the Seymour Hall, London, W.1. from November 24 to 29. An official of Raleigh Industries, Ltd. said: "The volume of orders is highly satisfactory and indicates strong reason for hoping that the industry will achieve the target set by Sir Stafford Cripps. Many of the cycles shown were specially designed to suit overseas markets.

THE EBBW VALE WORKS OF Richard Thomas & Baldwins, Ltd., feature in a film "Pattern for Progress" about to be released. The film shows the various processes of making steel, sheet and tinplate, from the basic materials to the finished article and interest in it should not be confined to technical and semi-technical audiences. Completed in 1938, the plant was partly of American and partly of British construction. Ebbw Vale's normal production includes plates up to 1 in. thick and tinplates down to 0.010-in. It can produce sheets up to 20 ft. long and 6 ft. wide. The electrolytic tinning plant is the only one of its kind operating in Western Europe, although in America some 40 per cent. of the output of tinplate is produced by this process. Ebbw Vale produces more than a quarter of all the steel sheet and tinplate made in Britain.

AT THORNBURY, BRADFORD, former women employees of the English Electric Co., Ltd., are playing a substantial part in efforts to increase production by assembling components at their homes. A van delivers the parts and collects the finished articles.

PHOTO of the MONTH

INCENTIVES for INDUSTRY

by A. J. SPEAKMAN

THE inescapable fact of the present industrial situation is that, either the national standard of life must be reduced, or else work—effective work—must increase to a point where it is commensurate with the high wages being paid in the majority of industries.

The moment when we must begin to live within our income has come, suddenly and dramatically, and it is imperative that we take stock of our industrial position with a view to increasing production and reducing costs. These objectives can be obtained in two ways ; by improvement in plant and processes, and by improved performance by the individual worker.

The position regarding design and delivery of new plant is such that many months, or even years, may elapse before improvements can be effected in this direction. The immediate solution of the problem, therefore, must rest with the individual.

It is generally agreed that the rate of working in the majority of industries is very much lower than it was before the war. Indeed, the opinion has been expressed in responsible quarters that it takes three workers where two were employed pre-war. If this is so, then it certainly throws new light on the man-power shortage ! Though no useful purpose will be served by generalising it is obvious that, whatever the hourly rate, the performance of different workers on the same type of work will vary, not only in competence, but in diligence. In the same way, different industries as a whole can be compared.

One of the major difficulties confronting our basic industries at the present time is that, because of the series of crises and depressions in the between-the-wars period, they tend to pay a lower basic wage than some of the new light industries to whom they are losing the younger generation of workers. The Government's proposal to cut down supplies of raw materials to non-essential industries—which, in effect, is economic direction of labour—may only aggravate the problem by creating a large body of disgruntled workers.

If therefore, the basic industries are to attract and retain their share of good labour, they must offer pay packets which can compare with those in other industries and assure the worker that he is " worthy of his hire." In effect, this means that additional money must be paid to the workers over and above the basic rates. At the same time, if industry is to pay its way, the extra money must be earned and not given.

It is paradoxical that war, and its aftermath, should have removed one of the strongest incentives to work hard, namely, fear of unemployment. The trend of political thought and social legislation are such as to ensure a feeling of individual security. At the same time, the fear of mass unemployment is not removed, and this could well have the effect of all workers in a particular industry wanting to " spin out the job " by working at a reduced pace. Social security, however, is vital to the well being of us all and it is eminently desirable that the incentive to work hard should be replaced by some more satisfactory inducement. Improved management, working conditions and personal facilities, all have their place, but it is only monetary incentives which show the maximum results in production efficiency.

The problem, therefore resolves itself under two headings :—

(1) To determine the normal output.
(2) To relate the increase in remuneration. to an increase in output above the normal.

In this connection, it is considered that Time Study offers the best angle of approach because it is, fundamentally, a method of analysis by which labour, tools, and materials are all examined under their respective headings and the findings collated to give the most economical set up. Moreover, by determining the normal amount of effort required, it is possible to differentiate between the good and the not-so-good performer and to encourage both to give of their best.

In the past there has been much opposition to incentive schemes on the part of labour due to the suspicion that greater individual production would lead to unemployment and also the fact that, if earnings got too high, the rate would be cut. Management, also, very often opposed schemes of Incentive Bonus for a variety of reasons, that quality would deteriorate, that labour might be unsettled, that it would involve too much clerical work, and, as often as not, from ignorance as they had not

had experience of such schemes before.

The present time, however, with its shortage of labour and demand for increased production, presents an opportunity to Management and workers alike which it would be foolhardy to miss, both in the individual and national interest. At the same time, the standards for output must be fixed by thoroughly competent people so that errors are not made and, once the rate is fixed, it must be regarded as a contract between Management and worker which cannot be altered.

While no attempt is made here to define the technique of Time Study, because it is treated best as a separate subject, it is considered to be the most powerful aid to production efficiency and the prerequisite of those who seek to deal in realities. Morover, one thing is now certain, wages—whether they are piece-work or plain time rates—must be related to productive work. There is no escape from this fact and Industry as a whole must work out its own salvation within these limits.

In conclusion, it may be helpful to enumerate the various factors which are essential to the satisfactory operation of any Bonus Scheme—

Simplicity. It must be easy to understand so that the workers know precisely what is expected from them. It must also be easy to calculate both for clerical reasons and to enable workers to calculate bonus when they have completed the task.

Directness. The remuneration should be proportionate to the effort put in so that variations in performance are reflected in the pay packet.

Economic. While it must be economic to the Company, the reward should be sufficient to induce the extra effort. At the same time, it should not be so large as to unsettle other workers who are not on bonus.

In addition to these points, it is essential to establish the integrity of the scheme as a whole, to show how the standard times have been obtained and what factors, such as fatigue, etc., have been taken into consideration for Time Study must stand or fall according to its method of work measurement.

This is the only possible way to obtain whole-hearted acceptance of Time Study Methods by Trade Unions and complete understanding between Management and worker.

Jointed Dolls from Obsolete Vehicle Parts

Manufacturers of jointed dolls, leather slippers, and cotton goods have directly benefited from the post-war salvage drive of Leyland Motors Ltd., which owing to a more scientific approach is even more intense than any salvage campaign during the war.

Since " V " day, this drive has resulted in the disposal of over 20,000 tons of scrap material at a saving of over £150,000. One fifth of this tonnage is literally " put back in the business " in the form of re-melted ferreous and non-ferreous material for future use in vehicle components. Only the material which has been produced by the Leyland foundries is used for re-melting, the rest being disposed of to contractors.

Most of this valuable metal is collected from machined components in the form of " turnings " and " borings," each type of metal being collected in separate containers. " The segregation of the different types of metal is one of the most important features of the salvage drive," said Mr. J. Hodkinson, Leyland's Disposal Officer. " Phosphor bronze collected during the machining of Leyland rear axle worm wheels is worth £114 a ton. If a small percentage of brass were to be mixed with this, the disposal price would fall rapidly.

" Some of the material is scrapped because of modification in design," he said. " One batch of rubber sealing rings became obsolete owing to a modification. Instead of selling these as scrap, a manufacturer of jointed dolls was found who could use these rings intact in his dolls."

The good quality leather cuttings from the hide upholstery of Leyland buses are sold to authorised leather dealers at £50 a ton for use in the manufacture of slippers and footwear.

Even electric lamp caps are salvaged and sold at £11 a ton, whilst white metal collected from the old bearings of engines under overhaul at the company's Chorley Works is melted into ingots which have a current price of £364 per ton. The lead out of disused vehicle batteries has also a high price and if disposed of in the proper quarter will yield as much as £1 a battery.

Electronic Measurement

The application of electronic techniques to industry is extensively surveyed, with the primary object of stimulating interest in the use of such techniques as an aid to industrial efficiency as it is felt that many industries have not yet been made aware of the versatility and great possibilities of this new branch of engineering.

THE THIRD ARTICLE OF A SERIES BY D. M. SWATTON

IN the previous two articles of this series, first, free electrons were introduced as the electrically negative units which, produced in an electronic device, form the sensitive element of a low inertia mechanism; and secondly, the basic electronic principles and devices were discussed briefly. The time has now come to talk about how the free electrons are put to work in the devices to aid industrial production and, equally important, industrial research.

In many industries further development of the methods of research and production can be achieved only by adopting improved techniques of measurement, inspection and control. An improved technique is one that provides an equal, or a greater accuracy and certainty of determination of quantity or condition, by diminishing the liability of errors due to human fallibility or instrumentation discrepancies, and at the same time allows for the introduction of methods which permit the more effective employment of technical and productive personnel.

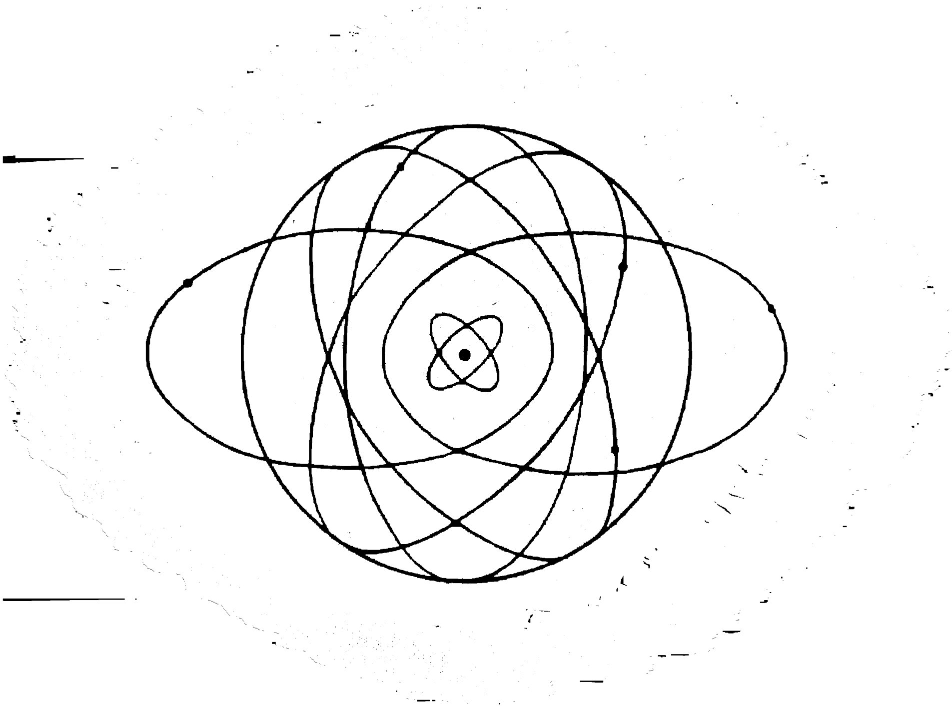
As the result of the application of electronic techniques of determination to industrial research, conclusive investigations are now made in a fraction of the time required with the slow and laborious methods used previously. Applied for productive purposes, electronic techniques of measurement, inspection and control have greatly increased industrial efficiency by saving man-hours and material, the first, by providing for faster, and in many cases, automatic determinations, and both, by closer control of quality, which means fewer rejects at different stages of processing.

For industrial measurements electronic devices now available can in most cases give more accurate and consistent results than precision instruments depending on the movement of a mechanical system.

When a mechnical system is involved accuracy can be obtained only by an extremely delicate movement, hence many precision instruments are suitable only for the laboratory. Even with laboratory instruments there is still some mechanical loss, and inertia which may affect the accurate indication of rapidly varying quantities. With electronic instruments, the loss and inertia are negligible, so that their accuracy and sensitivity are a maximum, but at the same time they are robust, which means that laboratory standards of measurement can be readily achieved under manufacturing conditions.

As electronic devices operate by electrical changes, an element detecting a physical change must in some way produce an electrical variation that can operate an indicator

INDUSTRIAL APPLICATIONS OF ELECTRONICS



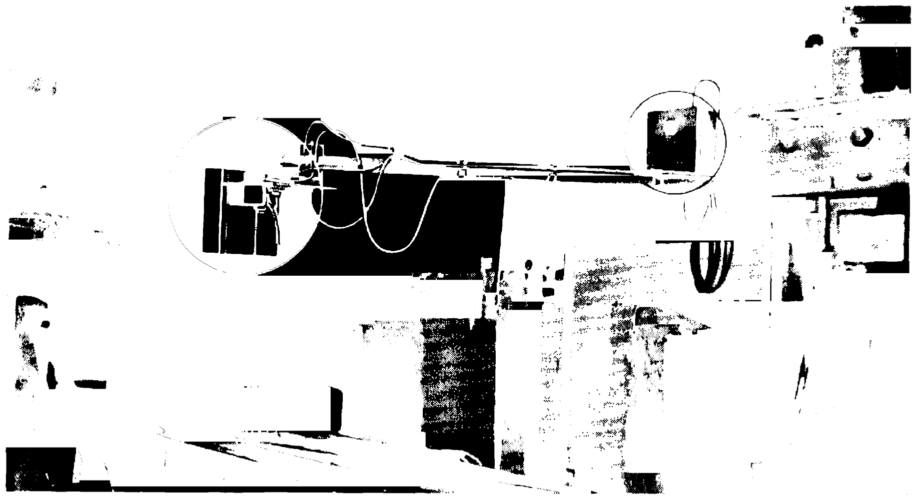
directly, or can be amplified to a value to operate an indicator. Ingenious detectors have been devised for a variety of measurements.

A simple method of changing a mechanical movement into an electrical variation is illustrated in Fig. 1, which shows one form of electronic micrometer, equivalent to a mechanical type giving a direct indication. The detecting element is actuated by a lever, but this is the only mechanical link in the system, hence the constraint imposed is small. This element consists of two light metal anodes (positively-charged plates) fixed to a ceramic or glass bead carried on the end of a light lever, supported by a flexible diaphragm. The two anodes are, of course, insulated from one another, and each is connected, through a resistance, to the postive of a D.C. supply. Between the two anodes is a heated filament, supplied from a battery. The whole assembly is enclosed in an evacuated glass envelope with light, flexible connectors, and it forms, in effect, two diode valves.

When the lever is in its normal position, the filament is exactly central between the two anodes, so that there is an equal flow of electrons to each anode, and through each circuit from the positive to the negative. A galvanometer is connected across the two circuits, and when the currents are equal, no current flows through it. The application of a force to the end of the lever moves the anodes relative to the filament, so that one is nearer, and the other farther away. This has the effect of making the force acting on the thermionically-emitted electrons increase in one case and diminish in the other. In electrical parlance, the resistance of one diode is increased while that of the other is decreased, and the currents through the two circuits are no longer equal ; the out-of-balance current flows through the galvo, which is calibrated to directly indicate the mechanical movement.

The resistance-change method of indicating mechanical displacement has been developed for measuring strain in structural members. Fine-wire resistance elements, in the form of prepared strips, are glued to a roughened and clean surface of the member under test. When the member is stressed the strain alters the length of the resistance element, and therefore, its electrical resistance. The resistance change is used to operate an electronic measuring system.

One type of electronic micrometer capable of indicating millionths of an inch is operated by changes in " radio-frequency resistance." The system employed involves the use of a



thermionic valve as an " oscillator." Used in this way, the valve generates a high-frequency alternating current from a direct current input.

Fig. 2 shows a pentode valve arranged as an oscillator, and forming part of a simple electronic micrometer. The scheme involves a number of coils for providing "inductance," and condensers for providing "capacitance."

To appreciate why inductance and capacitance are required it is necessary to consider in an elementary way what is meant by these terms.

Briefly, inductance is the property of a coil which causes it to generate a voltage opposing the movement of the electrons (current) initiated by the application of an external voltage. The generated (induced) voltage cannot stop the motion of the electrons because the applied voltage is greater, but it does restrict the flow if the applied voltage is alternating. With a direct voltage, the inductance of a coil is effective only during the first few moments when the circuit is made.

But apart from being the cause of a voltage opposing the applied voltage, inductance is also responsible for the generation of a voltage which, when the flow of electrons starts to diminish due to the applied voltage decreasing, tends to maintain the flow.

Technically, this explanation of inductance is rather crude and incomplete, but it may serve for the present purpose. The important points to remember are ; first, inductance

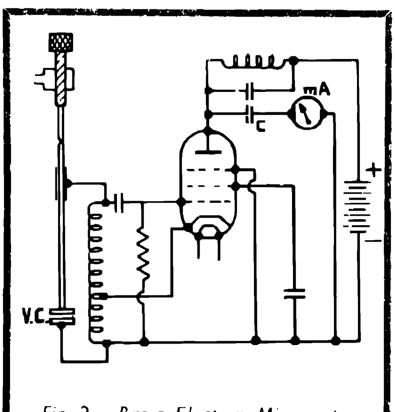


Fig. 2. Basic Electron Micrometer using Valve as an Oscillator.

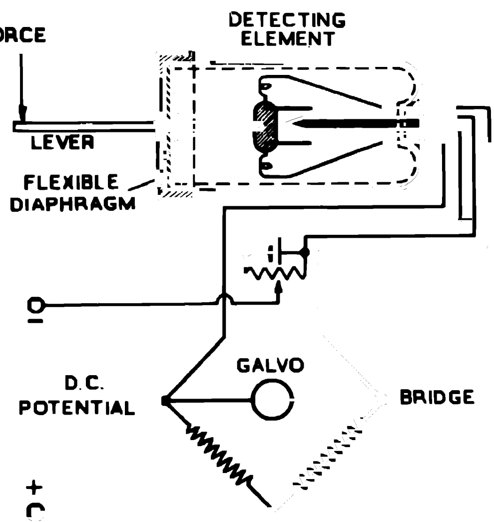
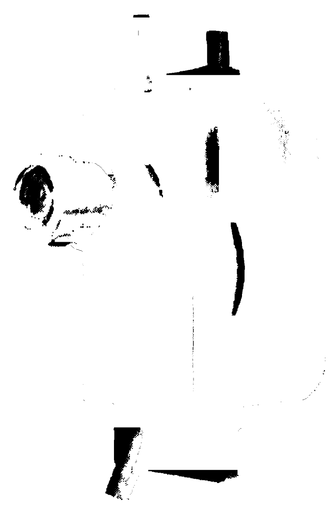


Fig. 1. Gunn Electronic Micrometer.

Fig. 3 (on Right)—Water-cooled photo-cell housing of photo-electric pyrometer equipment.

Fig. 4 (opposite)—Application of photo-electro pyrometer to measurement of billet temperature.



limits the amount of current that can flow when a given *alternating* voltage is applied; second, the limiting effect (or in electronic parlance, the radio-frequency resistance) increases with the frequency of the voltage; and third, due to its inductance a coil generates a voltage when the current flowing through it varies in magnitude.

Capacitance is the property of a condenser, which enables it to store electrons when a voltage is applied and subsequently removed.

If a coil and a condenser are connected in parallel together, and a voltage applied momentarily, the combination will generate a high-frequency alternating voltage. Roughly the action is, first, that the applied voltage charges up the condenser, and at the same time passes current through the coil. When the voltage is removed, since the condenser is still connected to the coil, it begins to discharge into the coil. The current through the coil increases until the condenser is fully discharged, and then begins to decrease; but in so doing, a voltage is generated in the coil, and as it is connected to the condenser, this is recharged because the generated voltage is applied to it. The condenser subsequently discharges through the coil, with the same result as before, so that there is an oscillation of electrons backwards and forwards between the condenser and the coil. The oscillations are not maintained indefinitely, but die away at a rate determined by the normal resistance of the circuit. They can, however, be maintained by the intermittent application of a direct voltage, or the continuous application of an alternating voltage.

The frequency of the oscillations can be varied by adjusting the number of turns on the coil, or the distance between the condenser plates, or both. There are other ways of varying inductance and capacitance, but those stated will serve for the present purpose. Variation of inductance, capacitance, or both changes the "radio-frequency resistance." This simply means the *resistance* offered to the passage of current at voltages alternating at the very high frequencies associated with radio engineering, as distinct from the low frequency of normal alternating current supply.

Referring now to Fig. 2, when the D.C. supply is first switched in, the anode or plate of the valve becomes positively charged, and electrons flow from the cathode. The flow of electrons, completes a circuit between the electrodes so that current flows into the oscillatory system of coils and condensers shown diagrammatically to the left of the valve. Due to the combined effect of inductance and capacitance, a voltage builds up on the grid and has the effect of diminishing and then finally interrupting the flow of electrons to the anode. The supply to the oscillatory system is now interrupted, consequently the generated voltage diminishes, the grid voltage falls, and the electrons again begin to flow to the anode.

The valve is, in effect, an automatic switch that makes and breaks the supply to the oscillatory system so that it will continously generate an alternating voltage at a frequency determined by the values of inductance and capacitance, in other words, the radio-frequency resistance.

With a given R.F. resistance, there will be a particular voltage variation on the grid of the valve (voltage-swing) and this will affect the

Please turn to page 76

MISCELLANY

FLASH BUTT WELDING OF LIGHT ALLOYS

Sciaky Electric Welding Machines Ltd., of Slough, have recently introduced a flash butt welding machine for aluminium alloy sections. This machine type F.B.A., depending upon the manner in which it is tooled, is suitable for either straight or mitre joints, and has been developed very largely owing to the great demand for the use of this process in fabricating light alloy assemblies, and particularly aluminium window frames, wheel rimes, tubes, etc.

Developed entirely in Great Britain, the machine follows in general outline machines of the same type used on mild steel. The welding operation however, is of novel conception and utilises compressed air incorporating a special " Sciaky " system of variable speed and synchronised flashing and upsetting individually controlled and adjustable.

A machine of this type suitable for window frame sections and similar sections approximating to the same cross sectional area, is rated at 200 k.v.a., this type of machine is fully automatic in its welding cycle, and can be used by completely unskilled operators.

OLD CORNISH BEAM ENGINE SAVED

British Timken Ltd., Birmingham and Duston, Northants, and Fischer Bearings Co., Ltd., have sent a donation of £25 to the Cornish Engines Preservation Society.

It is given to the Endowment Fund started following the purchase by the Society of the old beam engine which in its later years worked on East Pool Mine near the main Truro-Penzance road. The engine is known to thousands of engineers who, holidaying in Cornwall in past years, stopped their cars to watch it working.

With the closing of the mine, the engine was offered by the liquidator for disposal by tender, and it was feared it might be broken up for scrap. The Society secured it, however, for £250. All the money for this came from America. Money to endow the acquisition is being raised here.

Mr. John Pascoe, the Deputy Chairman of British Timken Ltd., and Fischer Bearings Co. Ltd., is a member of the Council of the Cornish Engines Society and he appeals to Cornishmen in the engineering industries, who may be out of touch with these efforts in Cornwall, to help the Endowment Fund. Subscriptions may be sent to him at British Timken Ltd.

COMPANIES ACT, 1947 FIRST PROVISIONS

The Board of Trade have made an Order (S.R. & O. 1947, No. 2503) under Section 123 of the Companies Act, 1947, bringing into force, with effect from 1st December, 1947, certain provisions of the Act which are set out in the schedule to the Order.

The provisions brought into force include those conferring additional powers on the Board of Trade in respect of investigation intothe affairs of companies as well as into the ownership of shares in companies (Sections 42 to 49);

the provisions prohibiting the registration of companies by undesirable names (Section 78);

the provisions dispensing companies from having to disclose the previous nationalities of directors and previous names of directors where the name was changed or disused before the person concerned attained the age of eighteen or has been changed or disused for a period of not less than twenty years (Section 27, sub-sections (6) and (7));

the provisions making it easier to alter the Memorandum of Association (Sections 76 and 77) and

the provision that the fully paid up shares of a company need not, in the circumstances laid down, have a distinguishing number (Section 69).

The Order also brings into force all the provisions of the Companies Act amending the Registration of Business Names Act, 1916; in particular

Section 116 (1) which empowers the Registrar of Business Names to refuse to register any name which is, in his opinion, undesirable,

sub-section (3) of that section which removes the requirement that a person's nationality of origin must be stated, and sub-section (4) which removes the obligation to state former names which have been changed or disused before the person concerned had attained the age of eighteen or have been changed or disused for a period of not less than twenty years.

THE GAUGE AND TOOL MAKERS' ASSOCIATION

THE next Quarterly Luncheon for the members of the Association and their guests will be arranged during the period of the forthcoming Gauge and Tool Exhibition at the New Hall, Vincent Square, London, from 26th January to 6th February, 1948.

This Luncheon will be held at the Savoy Hotel, London, on Thursday, 5th February, 1948, at 12.30 for 1 p.m., and a number of important overseas visitors will be attending as guests of the Association.

The Guest of Honour and Chief Speaker will be the Rt. Hon. Oliver Lyttelton, P.C., D.S.O., M.C., M.P.

BRITISH STANDARD No's 1401-2-3

THESE new British Standards for solid drawn copper and brass tubes are based on B.S. 659, B.S. 885 and B.S. 886 which have been adapted and amended to suit the special requirements of the Gas Industry.

B.S. 1401 is for copper tubes, plain or screwed as may be required, for installation work and also for gas lighting fittings.

B.S. 1402 is for annealled brass tubes for installation work normally screwed.

B.S. 1403 is for brass tubes for gas lighting fittings normally screwed, these tubes are intended for the manufacture of pendants, brackets and other lighting fittings and are somewhat stiffer than for installation work.

Tubing of the kind for installation work has to withstand bending and manipulation at site; for special purposes where maximum flexibility is required as, for example, in bent connections to meters, fully annealed copper tubing is advised in the foreword. Each standard includes tolerances as to size, and prescribes tests. In the case of B.S. 1403 a mercurous nitrate test is specified.

Copies of this Standard may be obtained from the Sales Department, British Standards Institution, 24, Victoria Street, London, S.W.1. Price 2/- post free.

HOFFMANN JUBILEE

ON the 11th January, 1948 The Hoffmann Manufacturing Co., Ltd., Chelmsford, Essex, England, will celebrate the 50th anniversary of its founding.

When the Company commenced the manufacture of Ball and Roller Bearings 50 years ago, the demand was very restricted and naturally the employment was small. To-day the company employs 300 times as many people as in 1898.

The one small factory at Chelmsford has been expanded many times and it has been necessary to manufacture outside Chelmsford. During the war a factory in Ireland was built and operated.

The infant beginnings of the Company catered for the then very small demands of the motor industry and for the earliest applications of thrust bearings used on crane posts and slow moving foosteps. The problem of marketing ball and roller bearings was even greater than their manufacture, and the growth of the Company has been built upon technical service as well as excellence of manufacture. At the present time Chelmsford has become the headquarters of anti-friction bearing information.

During the fifty years of the Company's growth, many of the employees have attained records of long service and during 1947, sixty-four men with forty years and seven women with thirty-five years service were the recipients of long service awards. At the distribution function there was present a retired employee who saw his son receive an award after forty years service.

BRITISH GLUES GROUP NEW PENSION SCHEME

A PENSIONS scheme for all adult employees of British Glues & Chemicals Ltd. and associated companies (Croid Ltd., B. Young & Co., Ltd., Calfos Ltd., Standard Soap Co., Ltd., Personality Beauty Products Ltd., and O. Murray & Co., Ltd.) came into operation last month. The scheme, applicable to employees over 21, takes into account past years of service, and the company has made an initial contribution of £50,000 to inaugurate the scheme.

Pensions are on a contributory basis, and a novel feature is the provision of two separate schemes to cater for the differing needs of works and staff employees.

INTERESTING ENTERPRISE No. 17

PRE-FABRICATION IN PAINT

From brake-blocks to buses and from cosmetics to rubber-heels, the need for clear identification of a firm's products is always of great importance. An outline of the scientific development of paint transfers of all types is told in the following story of "Trapinex Ltd."

It is an experience that comes to few people to achieve one of the ambitions of childhood. In those far off days when, believe it or not, shopkeepers were civil; we used to buy penny sheets of transfers of doubtful origin and even more doubtful quality, from the local toyshop and with them we beguiled many a youthful hour.

As far as we can recollect the feminine section of our youthful community used to preserve these specimens of foreign enterprise in exercise books, albums and the like whilst the male section, scorning such effete practices, invariably reproduced them on the back of the hand, on the window or, when safe from parental interference, on the walls and doors of the house.

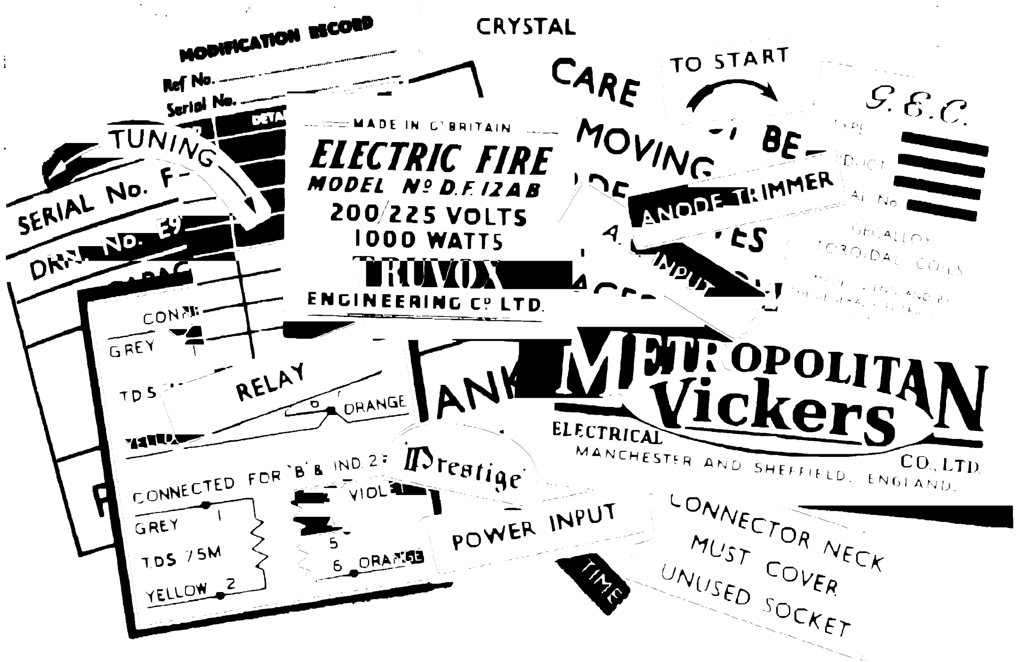
The consequences of such practices were often painful to the perpetrator and frequently led us to a dream of a Utopia wherein the attachment of our favourite transfers to any available flat surface, would be treated as natural, right and proper! Although we have advanced in years since then, the recollection of our dream was brought home to us last week in North London.

On that occasion we were the guests of Mr. F. W. Burgess, Managing Director of "Trapinex" and, at his invitation, we spent several hours absorbing the lore of the transfer business. One of the first things that struck us as Mr. Burgess showed us round was the prolific outcrop of transfers visible at every turn.

Apart from the obvious and planned display in the main office we were met at every turn by some fresh example. On the walls, the windows, the pillars and posts and even on the ceiling. We might have missed the latter had not our guide drawn our attention to them as we passed.

Another point of particular interest was the wide variation in size and shape. The specimens we saw ranged from tiny trade-marks about ¼ in. square to giant designs in several sections making up a strip 17 feet long. Striking also was the fact that about 65% of the designs, names and trade items we saw were old friends; names and products we were familiar with but, until that moment, we just hadn't realised that their design was a transfer. An unconscious tribute to the effectiveness of the medium—the message had been put over but the medium had not obtruded itself.

It would be difficult to say just what we had expected from this visit. That an unusual story lay behind the rapid growth of "Trapinex" was obvious but what exactly we could find to tell and what would be avail- in the way of photographic material was yet to be seen. When we had chatted to Mr. Burgess and he had shown us round it became obvious that our story would have to



stand on its own feet, it could not rely on photograhic help for, when all the work in a factory is skilled hand work and no machinery is used what is there to photograph ?

Add to this the fact that "Trapinex," bombed and blasted out of its original home is housed in temporary and restricted quarters and you are left with something of an idea of the problem. Therefore we resolved, the thing to do was to get Mr. Burgess under a heavy fire of questions and thus get *him* to tell the story.

We asked him first to describe the various types of transfer and their characteristics and we learned that there are five principle groups of transfers—slide-off, sandwich, reverse on duplex, double-sided and stoving transfers "The slide-off type" said Mr. Burgess, "is the type with which you are probably most familiar. Here the design is the right way round and is printed in paint on a solid base of paint which, when dipped in water, will permit the design to be slid off on to the object which is to be identified. As a general rule, it is more convenient to produce this type of design throughout by our paint process. But, within certain limits it is possible to incorporate letterpress or litho printing with the paint process and so reproduce half-tones."

"The second kind," continued our host, "is the sandwich type. You may not be so familiar with it but it is the original type of transfer manufactured by this Company. It has advantages where there is a lot of fine detail or fine lettering, but generally speaking, designs we have normally done in sandwich type could be produced in the third type—reverse on duplex.

"And what," we asked, "is the reverse on duplex system ?" "In this type," Mr. Burgess said, "the design is printed in reverse on duplex paper which is then gummed on the back and applied as per instructions. We have concentrated lately on this type of transfer because this particular material is in greater supply than for the other types."

"As far as the decorative transfers are concerned, it has a disadvantage that the design cannot be seen unless it is an open design like these Red Indian and ship specimens here." So saying, he passed us two beautiful specimens which unfortunately we are unable to reproduce owing to the technical difficulty of matching the design and the colours. "Even then," he said, "the designs are the wrong way round. For industrial uses, however, they are very easy to apply and can be produced with or without a background.

"In the case of double-sided transfers," continued our informant, "designs are printed on both sides of an opaque layer of paint so that when applied to the window they

can be viewed from either inside or outside with equal facility.

"These have been mainly used for bus or shop window advertising and, in consequence, the examples we have are rather large, but the specimens we have produced for Riley Cars are a good example of industrial use, these being used on windscreens. Finally, in cases where it is necessary," said Mr. Burgess, "it may surprise you to know that we can manufacture transfers from paint which can be stoved at varying temperatures, the normal ones being 250 deg. F. and 750 deg. C. At the moment we do not manufacture ceramic types of transfers such as are used in vitreous enamel or pottery.

"Our normal transfers can also be stoved on various materials by use of a suitable stoving varnish, non-cellulose, they have in fact been stoved on metal as well as on plastic beakers, decorative designs for export markets being a very important feature here."

This brought us to another point. "What," we asked, "is the heat resisting ability of most of your transfers ?" "This is a question which often crops up," replied Mr. Burgess. "The most extreme case of resistance to heat is this electrical gadget." He passed to us one of the new Aerovap devices in which D.D.T. liquid is boiled overnight so as to fumigate the room and kill all flies. "The metal on which the transfer is placed reaches a temperature of 140 deg. C. without the slightest damage to the transfer, it being applied by water and has no added protection."

We suggested that during the war Trapinex must have found their services in great demand for identification markings. Actually, during the period 1941-1945 the number of transfers produced for the services and other Government departments ran into millions.

They were tested and approved for use in tropical countries by the Ministry of Supply, while the War Office also subjected them to their own tests before placing an order for many thousands of vehicle markings for the First Army, these being flown over and fixed by the troops on landing in North Africa. They were later used in vast quantities for other Army signs as well as by the U.S.A. Forces for huge aircraft identification stars and the familiar winged Mercury device used to denote all U.S.A. transportation vehicles on land, sea and air. We are given to understand that they were used successfully in every theatre of war.

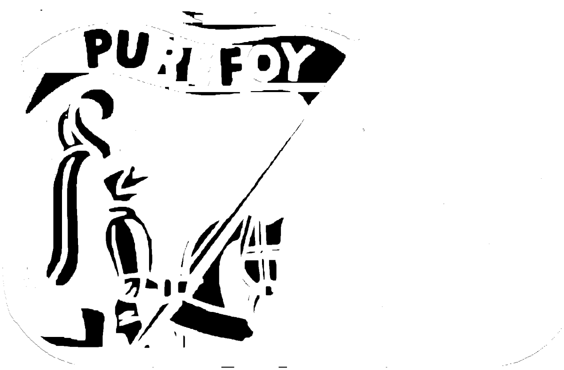
Other Government departments have used Trapinex transfers in large quantities including the Ministry of Home Security, all of whose vehicles had their ownership and type indicated by this means. They and the Central Control Commission for Germany have also used them for marking many thousands of number-plates.

They were also used by the Air Ministry for marking Radar equipment and on large numbers of high priority direct and indirect contracts, ranging from fuse markings, to bomb markings. Other vital uses included instructions for the use of chloroform apparatus dropped with airborne troops, water distilling equipment used on lifeboats, and flares thrown out by distressed airmen.

Another interesting job they did was the preparation of some 50,000 London Fireguard signs. These were printed direct on to asbestos sheets by Trapinex Ltd., who also supplied transfers for Assembly and Sector point numbers which were fixed by local Fireguards. Many of these signs can still be seen in first class condition after years of exposure.

This brought up another point. Our host had mentioned that the Fireguard signs were printed direct onto asbestos. We questioned this and were told that, in point of fact, quite

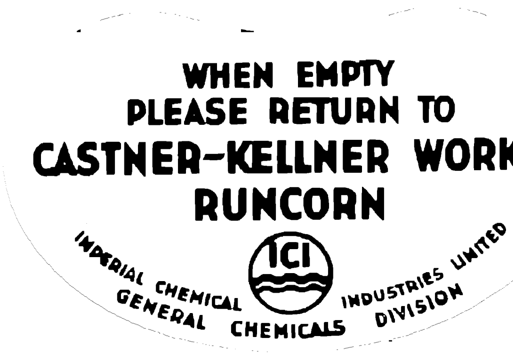
There is an interesting story behind this "alive" design. We were informed that some time ago two men were electrocuted and met their death through insufficient warning notice. This special transfer, compelling in its appearance, now acts as a safeguard against such accidents.

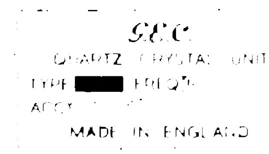


This design, in the colours given here, was probably seen by thousands of motorists in the days when they had petrol to be treated. It is a slide-off type transfer.

Another slide-off is this Knight design for Purefoy Unit Tooling Cases. An example of ordinary square-up design in three colours.

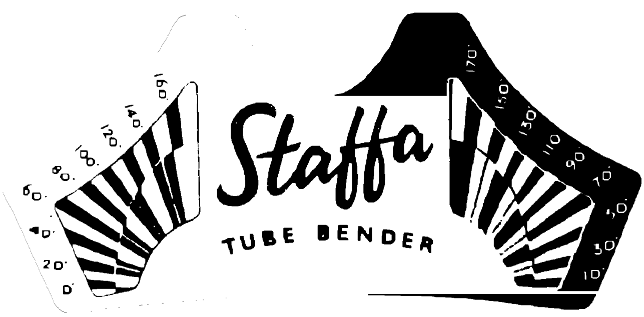
Here is an attractive name plate or name design, in the actual transfer the yellow is a rather deeper shade than this and the lion is in a browner shade of red.





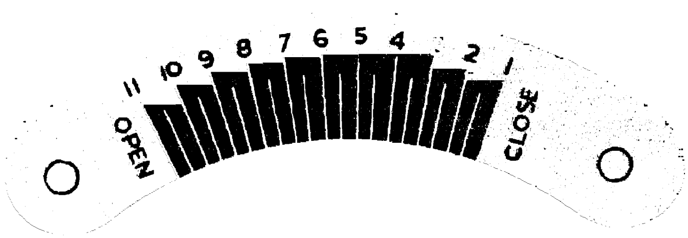
Above—This transfer in black and yellow replaces a data plate which would otherwise have to be screwed or riveted in position.

Top left—To withstand the acid on glass carboys of sulphuric acid is the job of this special transfer. In actuality it measures about five inches across.



Most readers will recognise this one. The data plate transfer from the Staffa tube bender, a slide-off in black and yellow.

Right — An ideal job for a transfer this scale, graduated between "open" and "close" would be quite expensive to make and fit by any other method, the original is about 8 in. in length.



a lot of jobs were done that way—the job is printed, in paint, by the same process as transfers are made—direct onto any flat surface. In cases where the final product is of suitable shape, it is possible to save the cost of making and applying the transfer by printing direct.

As a result of wartime association with the process when they became acquainted with it through Government specifications many firms are now specifying the transfers for their own products. Probably the largest users are the electrical and radio trades where they are used for an infinite variety of part markings, directional, warning and danger notices, as well as, of course, for applying brand names in a manner which gives a distinctive finish to any product.

Users in these fields include such well known names as G.E.C., Metropolitan Vickers, Cossor's, Thorn Electric, Phillips, Electricity Boards and local undertakings and many others. In this field one should also mention the fact that the paint transfers and the twin process, paint printing have both been approved by the Ministry of Supply for marking plastic fuseholders and metal meter covers used in prefabricated houses.

Among the many specimens Mr. Burgess showed us we noticed an unusually large number for the cosmetics industry. We asked why and what special advantage does the transfer offer ? Our host explained, " You see," he said, " here a high grade product calls for equally high-grade methods to feature the all-important brand name. While

STARLINE
BRAND

When the supply of containers varies or they are irregular in size, a transfer will save the delay of tin printing. The same transfer will also be used for other purposes.

SUPER

VISI GLO

A VISI-CHICK PRODUCT

petmix

Add 1oz. to 2 galls. petrol

This is an example of an open design in which the design is not marred by a background film. On glass this should prove most effective.

Whilst this could be reproduced on tin by tin printing there is no known method of putting it onto circular glass containers except by transfer.

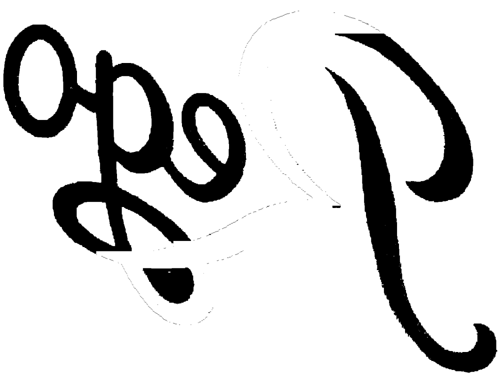
some very attractive labels are now being used, the fact remains that they are still labels which, with the limited range of containers now available, could well suggest to the public that the only difference between products was the label itself."

"With the use of transfers, however, it is possible to dispense with the label effect altogether and apply trade marks or decorations in brilliant colours without even a film to mar the effect. Such marks appear to be part of the container and apart from their highly distinctive effect cannot fail to impress the potential buyer with that sense of exclusiveness essential to the sales of a product in this field."

"It is not to be wondered at, therefore, that those who prize their names most come to us for a transfer to add the final cachet that means so much in developing maximum scales. Especially as they can be applied with equal facilities to glass, plastic, metal and any smooth surface. An interesting use is to indicate lipstick shades by means of small number discs which are applied to the base of the holder."

We wanted more information regarding the speed of applying the transfers to quantities of a product and we learned from our host that the application of any of the standard forms of transfer he had described can be very readily learned by unskilled labour and applied at production line rates; (one large user of plastic containers has completed fixing a million and a half, and the next order for two millions is being manufactured).

Reverse-on-duplex, this typewriter name transfer is a good example of this type. The design is on a thin tissue backed by a thicker cover paper.



These signature-type transfers are very popular, here is an example of an open red design in reverse on duplex.

Mr. Burgess said, in the course of conversation, "There is no limit to the size of the design we can reproduce, we have reproduced designs for sides of buses measuring 17 ft. 6 in. long and we are now producing pelmets for shop windows, these are produced in sections which are very simple to apply, each section being added to another, and the join is practically imperceptible."

"What specific advantages," we asked our host, "do you consider transfers to possess over the more ordinary display or advertising materials such as showcards or bills ?" His reply was :—"The lavish use of paper window bills, while apparently economical from the point of view of initial cost, does tend to result in an unsightly display, so much so that retailers in many trades have refused to have any bills at all.

"Unfortunately, the weather plays havoc with paper bills with the result that the life is comparatively short, and unless they are renewed constantly, the continued use of a partly defaced bill, tends to create odium in the minds of prospective buyers instead of goodwill. Moreover window bills are inclined to interfere with the free inspection of the goods on display.

"With transfers, however, once in position they last indefinitely, are not affected by the weather and should they ever require cleaning, this can easily be done by the window cleaner with a clean cloth.

"You can get a good idea of the lasting quality of a transfer from the fact that large name designs applied to match boarding surrounds to the blitzed windows of Messrs. Dunn & Co. Ltd., the well known hatters, in 1941, are still in perfect condition and even better than the paint on which they were applied. Sainsbury's Ltd., London Grocers, had 6 ft, window streamers on asbestos window substitute for 3 years and they were still in good condition when removed to apply a new design. "Radio Times" and "The Listener" transfers have been up much longer.

Of even greater importance than their lasting quality is the striking interest compelling effect of the brilliant cut-out designs possible without film or paper to mar the effect, or interfere with goods on display. That is why retailers, even in the most particular trades, welcome the use of them as sales aids. One has only to look at the transfer display of Clark's Shoes for example, to realise just how striking and "high grade looking" they can be. This firm have used over a dozen designs, and their product is, of course, of the highest quality. There is hardly a village where one or more Trapinex paint transfers are not doing a first class job or advertising for leading manufacturers. There is no limit to size and some very striking window pelmets can be seen advertising Lyons Tea and Hornimans Tea, among others.

"Unlike gummed labels there is no fear of deterioration from the transfers being kept in stock. For instance Redferns' the rubber

continued on page 76

PRODUCTION EFFICIENCY IN SOUTH AFRICAN INDUSTRY

By Major EDWIN WILDE, A.M.I.P.E., A.I.I.Tech. M.M.S.S.G.B.

The author is an associate member of the Motion Study Society of Great Britain and is in practice as a consultant in South Africa. This article was written and sent to us in response to a request for his opinion of the comparative efficiency of industry in his territory. As many of our young production men may be thinking of emigrating to South Africa, Major Wilde's experiences may be of interest to them.

SOUTH Africa at the present time is being literally invaded by men who are fully qualified in the professions of Industrial and Production Engineering as we know them in Great Britain to-day. Many of these technicians have no previous knowledge of South African industrial development, and, as a result, are bitterly disappointed by the poor response with which their services are received. The writer has recently been able to observe industrial conditions in the Union at first hand, and it is with the intention of informing would-be immigrants of the prevailing outlook that this article has been written.

No one can deny that South African industry is expanding very widely, and that, to-day, articles and commodities, ranging from heavy machinery to clothing, are being produced by local enterprises on a scale hitherto unknown. The quality of these goods is excellent, and can compare favourably with anything now being produced by the older, more established industrial countries. The quantities manufactured, however, are, with the exception of the clothing and, of course, the tobacco trades, very small in comparison with, for example, Great Britain. It is this small output, coupled with very little standardisation of products, which makes things extremely difficult for the newly arrived and, therefore, inexperienced Production Engineer.

The factories of South Africa are, in the main, " Jobbing Shops." Each order accepted by a firm is, in most cases, quite different from any previous job which has been produced and, further, it is only in rare circumstances, that a repeat order for the same equipment is ever received. Consequently aspects of factory organisation, such as Production Control, assembly lines, complete mechanisation and the like, which are firmly established and recognised phases of British production are quite unknown in the Union. Each order is tackled on its merits and, when the blue prints reach the shop, it is usually left to the foreman to decide for himself the best way of manufacturing the product required.

A few weeks ago I had the pleasure of visiting one of the larger electrical switchgear factories situated on the outskirts of Johannesburg. This particular organisation enjoys a reputation for quality of products second to none in the Union. The works are kept extremely busy and are, at the moment, undergoing considerable expansion in order to cope adequately with the numerous contracts which have been placed with them.

As a Production Consultant I was naturally very keen to see how the various jobs were carried out and, from experience gained in Great Britain and other industrial countries, I fully expected to see at least some evidence of well thought out mass production, material flow or operation sequence. I was disappointed on all three counts !

The main assembly shop consisted of a very large and spacious shed, brick built with a corrugated iron roof, and in it were a dozen or so large switch boards in the course of erection. The boards were scattered about anywhere in the building and, between them, dotted here and there, were other items, such as distribution kiosks, flame proof switches and the like, also in the process of assembly. Each switch board was entirely different from its neighbour, and there were no two jobs exactly alike in the whole of the shop.

I asked the Works Manager for some details of the orders carried out by the firm, and was

informed that most of the products were destined for the various mines of the country.

" Every mine has its own particular designs and ideas," I was told," and although each mine has standar d equipment throughout its workings, equipment entirely suitable for one Company would be completely rejected by the next. Hence every switch, switch board or kiosk manufactured here is quite different from any other. That is our main problem. There is absolutely no standardisation of products, except, of course, as regards the quality of the finished job."

I then asked him about the various smaller components ; meters, push buttons, fuses and so on which were more or less common to every switch board.

" All such items," he replied, " are bought ready made overseas and merely assembled to the panels here. We manufacture no such equipment in this factory, we only purchase from outside and fit as required."

Seeking for further information I then questioned him on Production Control.

" At present," he said, such control is impractically non existent. When the drawings reach the shop the foreman weighs up the job, and decides, say, that he will need half a dozen or so men to complete the order on schedule. He details off the men for the job, and leaves them to sort it out for themselves. One man may undertake all the copper work, another will drill all the holes in the angle and panels, a third will do the wiring and so on. All the employees are paid day-rate and, if, for example, they are ahead with their work, and they see a pal who is lagging behind, on maybe an entirely different order, they will go and give him a hand. Thus we cannot accurately estimate even the total labour cost involved on any particular order. The products are completed on time, the quality is good and the customer is satisfied, that is all that we do know ! "

He admitted that some form of Production Control was required in the factory, and intimated that he would soon begin to consider ways and means of introducing it. For the moment, however, things were being left as they were ; there was plenty of work to be carried out and the customers were quite satisfied with the quotations given for the various jobs. He admitted that overheads were high, but then, South Africa was used to high prices and, so long as the goods were delivered on time, and were of good quality, no one minded the few extra pounds that were spent in their manufacture.

A week or so later I paid a visit to another electrical company, specialising in the production of small, domestic electric switches and fittings. The company had a high sounding name, and its products enjoy large sales in the Union. I was, therefore, rather surprised when I was conducted over the premises and found that the main workshop consisted of nothing more than a glorified garage, in which one white supervisor and not more than half a dozen natives were working.

One or two benches were dotted here and there, and, upon these, huge piles of material were scattered in no semblance of order whatsoever. The native boys were placing a dozen or so bakelite mouldings into rough, wooden fixtures and assembling the various screws and other component parts to the mouldings in the old fashioned, " one-handed" methods. Finally, after searching for some time among the material heaps, finding a screw driver, and tightening down the various securing screws.

I pointed out the wastefulness of this method to the supervisor, and explained to him that, by properly arranging the material and introducing Motion Study methods of working, production could be increased considerably. The job was, really, ideal for mass production on modern, efficient lines, and there was no doubt that great savings could have been made by introducing two-handed working, a suitable bin-layout and prepositioned tools. The supervisor would have none of it, however.

" Why should we bother with methods of that description ? " he asked. " We can produce all we need by this way of working and, if we need to increase our output, why then we shall employ another couple of boys. Labour is cheap and plentiful, it would not pay us to install material bins or special tools ! "

And so, for the time being at least, that particular South African firm is quite prepared to carry on in the same old way, regardless of the improved production techniques which are accepted as commonplace by other industrial countries to-day. They are paying their way, and can turn out all the goods they need ; Motion and Time Study mean nothing to them, they can find all the labour they need for a few pounds a month, why should they stint themselves ?

In great contrast I one day visited a machine shop specialising in the production of spare parts for Rock Drills. This factory was equipped with some two dozen lathes and other machines, and really was a treat to behold after some of the other places I had seen.

The machines were well laid out, and production was efficiently planned. All material was fed to the operators at waist level to prevent stooping and bending, and there was a fine system of paper work and drawing office routine in force. It was evident that much care and attention had been paid to layout and flow of material ; the machine shop itself was capable of very little improvement, it was exceedingly well planned and organised.

Mass production was not in evidence, for the spare parts manufactured were rarely called for in batches greater than a dozen or so at a time, but there was one department which could have benefitted by a little " tidying up." That was the Inspection Cage.

This particular firm appeared to be very progressive and enterprising, and I have no doubt that attention will soon be paid to the application of improved methods to assist in reducing fatigue and increasing the output of the Inspection staff. At the moment this section is somewhat of a bottleneck, and could be advantageously streamlined along the lines recognised as the " one best way " by methods engineers of Great Britain and America. Apart from that one aspect, however, the factory was very efficient, and there was very little that a trained Production Engineer could find fault with.

Turning now to the clothing industry, we find an incredible motley of manufacturing concerns ! There are a few very large factories which employ over a thousand machinists and other working staff, the majority however, are tiny little back-room affairs which turn out dresses, overalls or underclothes with the aid of very few machinists working at very old, and worn out machines. These latter concerns literally swarm throughout Johannesburg and suburbs, and all seem quite capable of making themselves pay although, at the moment, there is rather a slump in that particular industry.

I was speaking one day to a business associate, and asked his opinion on the introduction of improved methods to the clothing trade as a whole.

" These people," he replied, " are very conservative in their ideas. They have set up in business here, many of them during the war when supplies from overseas were unobtainable, and have made a market for themselves. They find that their enterprise enables them to buy and run a powerful car, they have bought large houses, and they can purchase as many suits of clothes as they need. Why should they want to change their manufacturing methods, possibly at considerable initial expense, in order to make a few extra pounds on eventual decreases in overheads ?

" During the war they made money, to-day things are not quite so good, it is to their advantage to continue as they are, If they did produce more goods with the same staff and equipment, they would not be able to sell the additional quantities. Why, then, should they try ? "

His words, I feel, put the answer in a nutshell.

As a matter of interest I visited one of the larger manufacturers, and was kindly allowed to make a preliminary report on the factory. I found that the layout of machines left much to be desired, and that the material handling was very poor and was capable of much improvement. I told the managing director that, by paying attention to these, and certain other points, he could increase output by some 10%—15%. He showed polite interest, but his watchword was " Later " !

Things are not too good in the clothing trade just now, but I feel that, sooner or later, increased efficiency must come to, at least, the larger concerns as, otherwise, with the importation of lower priced goods, the position will become even worse ! I feel, also, that this view is shared by the more progressive manufacturers and that, when they think the time is ripe, they will have no hesitation in re-planning their plants along proved, scientific lines. For the moment, however, they prefer to sit tight.

In the sheet-metal industry things take rather a different turn. The other day I was called over to a fairly large factory which was contemplating the manufacture of steel filing cabinets and other similiar lines, on a very large scale.

They had the right idea, for they wanted to instal a smooth, well planned production line for these particular items. They had the market, and they wanted to produce the goods.

Speaking with one of the directors I was told that their difficulty was that of really skilled labour.

" If we only had a thoroughly competent foreman, and a really first-rate crowd of sheet metal workers," I was told, " we could install a proper line and produce goods of the high quality which the country demands. As it is we have never tackled high grade articles such as filing cabinets before, all our previous work has been on such items as galvanised iron tanks and buckets. For this class of product our staff is O.K., on work of more intricate nature, they would be hopeless."

Here is a case, then, of demand exceeding supply, and the answer to the problem is high grade, specialised labour. Natives are quite

suitable for unskilled or semi-skilled work but, until sufficient fully trained Europeans are available for the really skilled aspects of craftsmanship, the Production Engineer must, perforce, take a back seat.

The main wealth of the country has, until recent years, been found from the mines, and it is only in this field that Industrial Engineering has really come to its own.

The Bedaux Company for Africa Ltd. have been established for some fifteen years in Johannesburg and have done a very great deal to to improve the efficiency and working conditions of the huge labour force employed by the various mining houses. Even so their services have not been accepted without a prolonged struggle and, such is the conservatism inherent in the country, that it was only a year or so ago that one large group of mines called in their help, despite the amazing benefits which had been gained by other houses during the preceding years. From this one example the difficulties facing the immigrant production efficiency specialist can readily be imagined. South Africa is not yet fully alive to the advances which have been made in the fields of scientific management between the two world wars, she is slowly awakening it is true, but such an industrial revolution will take many years yet to become established.

Some weeks ago an Industrial Exhibition was held at Pretoria, the Union's administrative capital, and at the opening ceremony the Prime Minister, General Smuts, said, " For the sake of the future we now expect industry to operate at the highest level of efficiency and to produce the highest quality at the lowest price."

Regarding the quality of goods, especially in the engineering field, the country can now vie with the rest of the world ; the question of price is an entirely different matter. Recently I had an opportunity of comparing South African products ; saw benches, power hack saws, presses and guillotines, with imported articles from overseas. I was amazed at the finish, appearance and solidity of the local range displayed !

As a Britisher it grieves me to say that the imported articles from the U.K. were definitely not in the same class as the similar items manufactured in the Union, they were rough in appearance, had several jagged burrs on some of the parts, and were generally not of nearly such a high standard of excellence as the locally made product. The American range, which I also saw, was somewhere between the two ; the South African was definitely superior to both !

At the moment production in the Union cannot meet the demand but, in the years to come, when the present gap is bridged, I can visualise her products capturing all the local, as well as, may be, some of the overseas markets. This will be good for South Africa, but decidedly bad for Britain, unless the quality of her goods speedily returns to that pre-war standard which made her name ring around the world.

Returning to the main subject, however, I can sum up my impressions on the present day question of South African production efficiency, under six headings.

1. The industrial back bone is made up of a multitudinous array of " Jobbing Shops," which have very little interest in production engineering as such.

2. The cheap, easily obtained native labour precludes any necessity for more efficient methods of production technique.

3. The shortage of skilled, European labour in some trades makes the Production Engineer redundant.

4. The slump in other trades makes the switch over to more efficient ways of working uneconomical at the moment.

5. The natural conservatism of many industrialists acts as a severe brake on the introduction of improved methods and greater efficiency.

6. The few, really well organised factories, have little to learn from overseas specialists.

Within the next few years there will be, I am certain, a great demand for the services of the Production Engineer but, at the present time, the country is not yet ready for a wide scale application of improved methods. The present need is more for skilled artisans, than for production executives ; certain factories are awakening to the need for a measure of scientific control, and some steps in the right direction are being made. In the main, however, the time for the importation of the production sciences, has not yet come.

It would appear that Great Britain needs her army of production specialists far more at the present time, to help her wage her battle of output and to aid return to prosperity, than does her overseas neighbour. South Africa is an ideal country to live in but, for the Production Engineer, the Mother Country can offer far more !

I would therefore urge any members of this profession, who may be contemplating immigration, to think twice before embarking on a fruitless trip overseas. Fore warned is fore armed ; it is better to suffer austerity than disappointment !

Books

JIGS AND FIXTURES, *Leland A. Bryant and Thomas A. Dickinson, Pitman*, 25/-, 222 pp.

This volume deals in a detailed and authoritative way with that specialised branch of mechanical engineering—the provision and use of those tools peculiar to the modern processes of mass production. It is recognised that the tool requirements of industry are almost as varied as its products, and, in view of this, the authors are to be congratulated on the thoroughness with which they have covered this extensive field.

Not only is the actual design and construction of jigs and fixtures covered, but adequate consideration is given to the preliminary planning, co-ordination between design and tooling departments, and tool proofing, which should precede every production programme. The chapters in which pneumatic and hydraulic equipment and plastics, as applied to jigs and fixtures, are discussed are of special interest. The book is profusely illustrated; its style, although technically accurate in every respect, is such as to be comprehensible to the beginner. Its value is further enhanced by an extensive glossary of terms and appendix of engineering data.

COMMERCIAL ENGINEERING. By *James Bacon, M.B.E., A.M.I.C.E., A.M.I.Mech.E. Crosby Lockwood & Son, Ltd.*, 7/6, 288 pp.

In this work the author succeeds in providing the professional engineer with a valuable supplement to his technical training. It is felt, that to qualify for a position of managerial importance, the engineer must have an insight into the commercial aspect of his firm. It is to satisfy this need, in a thoroughly practical way, devoid of all unnecessary economic theory, and in a style capable of holding the attention of the man whose chief interest is engineering, that this book has been written.

The author has divided his work into two sections, the first of which deals in some detail with each of the commercial departments to be found in the modern engineering firm. The reader is introduced to the operations of the Sales Department, to the matters of estimating, tender, and contracts, the technique of advertising, and the functions of that department dealing with plans and specifications. Two chapters in particular are worthy of note; the first lists a number of manuals, registers, and directories, and the field covered by each, to which the executive engineer may turn for much useful data; the second offers a wealth of timely information of assistance in dealing with the various government departments.

The second section of this book is devoted to an elementary revue of general commercial and economic knowledge, less directly concerned with the operation of an engineering concern, but nevertheless of value to the engineer who seeks an executive position.

This publication is primarily a textbook, but one of equal value to the engineering student and executive.

LINCOLN'S INCENTIVE SYSTEM, *James F. Lincoln, McGraw-Hill Book Company, Inc.* 192 pp.

When first we opened this book we were prepared to be introduced to a new system of labour incentive in industry, but soon discovered that rather were we studying a philosophy of Management-Labour relationship. The author's aim in this work is to demonstrate that complete co-operation and sympathetic understanding between management and labour, coupled with a minimum of governmental interference, can raise production and our standard of living to an unprecedented level.

We recognise that any policy that promises to bolster production is of special interest to-day, but in this book we discover no device or philosophy which has not been advocated, in one form or another, many times before. The principles as set forth by the author, of working committees composed of representatives of labour and management, of the abandonment by labour of the "go slow" attitude, of the active interest of management in the personal welfare of the workers, are familiar talking points to all who are interested in industrial management; and are in no way unique as one might imagine by the way in which they are presented by the writer.

Mr. Lincoln is the managing director of the Lincoln Electric Company, of Cleveland, Ohio, and the proposals he has put forward in this book are supported by numerous examples of their practicability derived from his own company. If the reader is willing to overlook the advantage Mr. Lincoln takes of the opportunity to air his side of the disputes his company has had with various governmental authorities, this work may be regarded as one of general interest on American managerial policy toward labour.

PLASTICS

by W. S. PENN, B.Sc.

OVER the past two or three years, certain developments have been taking place which have led to the production of an important new plastic. This is called Polytetrafluoroethylene, and is marketed under the trade name of " Teflon " in the U.S.A. In the field of thermoplastics it has the highest heat and chemical resistance and is likely to be extremely useful, particularly under arduous conditions. At the moment there are difficulties in processing this material so that the forms into which it may be fabricated are limited. Nevertheless, even those simple shapes which are available should be extremely valuable under certain conditions. This new plastic was introduced by E. I. du Pont de Nemour of America in 1946, although the I.C.I. Ltd. in England had a great deal to do with its development. The reason for this will be obvious from an examination of its constitution.

Teflon is closely related to Polythene. The latter material consists of polymerised ethylene and has a very high molecular weight. It is this feature which imparts the excellent electrical properties and chemical resistance.

Teflon has exactly the same chainlike structure as Polyethylene, except that all the hydrogen atoms are replaced by fluorine. As is well known, fluorides of most elements are very resistant materials to all forms of chemical attack. Polytetrafluoroethylene is no exception to this rule. A few examples of this resistance might, with advantage, be mentioned. No known liquids, with the exception of molten alkali metals will affect it. As examples, it may be mentioned that it is unaffected by boiling aqua regia, sulphuric, hydrofluoric and fuming nitric acids. It is also resistant to all organic solvents and strong alkalies. Its water resistance is also excellent, and these properties should suggest many interesting uses in industry.

The heat resistance of this plastic is phenomenal. It can be subjected to a continuous temperature of 550 deg. F. with little evidence of any deterioration over a long period of time. In addition to this, it may be used at a temperature as low as — 100 deg. F., giving an exceptionally wide range. Temperatures above 550 deg. F. should not be used, not because the plastic chars but because some decomposition products are likely to be formed, with the resultant production of toxic fluorine containing gases. Nevertheless, here is a material which can be used in contact with any known liquid at temperatures up to 550 deg. F. This offers exceptional possibilities for gaskets.

It is these properties, valuable in some instances, which have made the plastic so difficult to process. First of all, since there is no solvent for the material, it will be realised that no cement for sticking parts together can be made. Again, the high moulding temperatures which would be required are far outside the range of most equipment, although it has been possible to mould some simple shapes. Therefore, the best way of fabrication is by machining. Here, the material can be very successfully shaped and very fine tolerances have been obtained. Coolants are not necessary, although a stream of water is an advantage, particularly from the point of view of eliminating toxic gases which could be produced by local high temperatures produced during machining. Teflon can be drilled, blanked and planed by ordinary methods and it may be easily threaded by means of the usual tap and die. For grinding to close tolerances, carborundum wheels and jewellers' rouge may be employed. For the purposes of machining, the resin has been made available in sheets, rods and tubes.

Very little compounding has been carried out with this new plastic. A few inorganic fillers have been added, but normally speaking this is hardly necessary in view of the already excellent properties of the material. It may be asked that if Teflon is so difficult to process why not add softeners or modify the plastic in such a manner that it would be more easy to process. This could, in fact, be quite easily done but in this case it is obvious that the heat resistant properties of the plastic would be destroyed and therefore this is not done.

In addition to chemical resistance, Teflon has many other valuable properties. It has, for example, as good and possibly better, electrical properties than Polythene itself. In this connection it has an exceptionally low power factor and dielectric constant, high

dielectric strength and volume resistivity and good arc resistance. It is satisfactory over the frequency range of 60 c/s to 3,000 M/cs. per second.

It may be wondered why Teflon can have these excellent electrical properties in view of the large number of highly polar fluorine atoms it contains. This is because these are symmetrically disposed about the carbon chain.

The plastic is better than Polythene in its mechanical properties. Its tensile strength ranges from 2,000 to 4,500 lbs./sq. in, and it has a very high impact strength. One possible disadvantage is the relatively high specific gravity of 2.2. These mechanical properties vary according to whether the plastic is orientated or not. If it is cold worked in one direction, its strength is increased in this direction. For high temperature work however there should be no orientation, else preferential contraction in one direction may take place.

At the present time, this plastic can only be employed for specialised applications in view of its high cost. However, it has been used a great deal for gaskets under particularly arduous conditions. Tubing is also available for conducting exceptionally corrosive liquids and non electrical Teflon tape has been used in heat sealing applications for covering heat sealing jaws and it has also been employed as a diaphragm facing in diaphragm type pumps and valves.

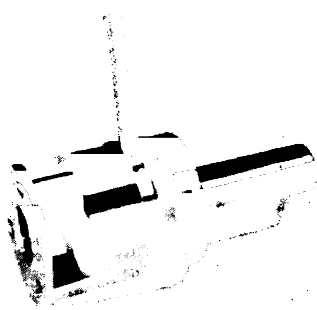
In conclusion one point common to this and other plastics should be mentioned. The material has a high thermal coefficient of expansion and frictional heat developed at high speeds is not dissipated due to low thermal conductivity. As a result, Teflon packing rings bind on shafts. To overcome this, Du Pont have developed a fibrous packing which has been used successfully at peripheral speeds of 1,050 ft./minute.

Knurling on Capstan Turrets and Centre Lathes

We illustrate here a new and unusual type of knurling tool made by the Lushington Tool Mfg. Co. Ltd. The tool is of the Box type and is furnished with a round and a square shank, either one of which can be removed. The round shank is designed for use in Capstan Turrets. Taper Shanks can be provided for this position for use in the Tail Stocks of Centre Lathes.

The square shank is designed for use in the Tool Holder of Capstan or Centre Lathes. By using the square shank on the side of the box, a component of any length may be knurled, since it will pass completely through the Box.

The capacity of this tool is up to ½ in. It carries two opposed Knurling Wheels, the carriers of which are first adjusted by a screw, the head of which is on the lever side. This is carried out with the lever in the horizontal position, the wheels being brought up in contact with the component. After once setting the operator need only lift the lever to the vertical position which gives the wheels a further initial closing action, the tool is then passed along the job. The lever is placed in the horizontal position and the tool immediately taken away.

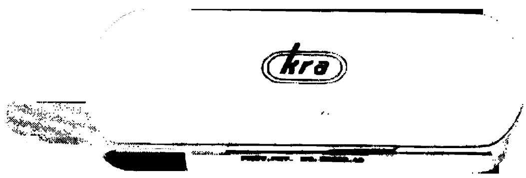


The new Lushington knurling tool.

An advantage is noted here over the old fashioned type of knurling box, which owing to its design had to be withdrawn over the knurled component; in a number of cases this resulted in a decided roughness often necessitating the scrapping of the Knurl already produced. This Knurling Box, being able to knurl in one direction and then be released, avoids any possibility of damage to the component knurled, and cuts down the operating time by nearly 50%.

Two further Knurling Tools of the three wheeled type are now in production. These wheels are disposed equally, and the three pressure points are admirably suited for working on tubing of thin section and on small components of a springy nature which cannot be contained between two knurls.

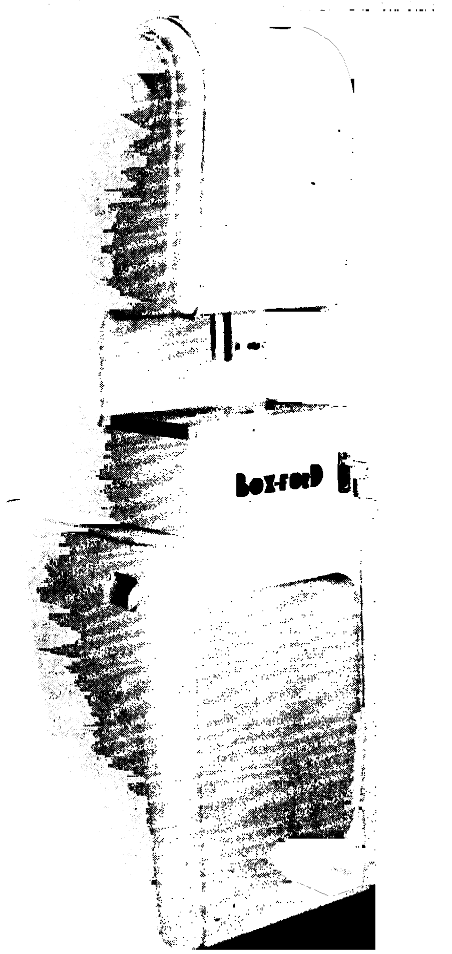
A simple, but very useful, idea is the incorporation of a boot scraper in the edge of this polishing brush by the makers of Kra Brushes.



DUSTRIAL DESIGN AND PRODUCT STYLING AESTHETICS

This is an unusually clean looking design for a press. The makers, Denford's Engineering Co., Ltd., have overcome the traditional "topheaviness" of flywheel presses by putting the motor, flywheel and countershaft in the base and driving the crankshaft through a ½ in. pitch Duplex roller chain over adjustable sprockets.

It is intended for foot or hand operation. 5 tons rating, 7½ in. —4 in. daylight, 120 strokes per minute.



AMERICAN DIGEST

Bringing news of the latest developments from the U.S.A.

Emery-Cement Floors. "Emeri-Crete" flooring is claimed by its originators, the Maguire Co. of New York, to be the toughest flooring material available to industry. It is composed of an emery-aggregate and cement (with water for mixing) and is said to improve with traffic. Apart from strength, it is dust-free, non-absorbent, easy to clean, non-shrinking and non-slip.

Mechanical Oscillator. To induce vibrations in various structures and assemblies, the Baldwin Locomotive Co. has introduced a compact, portable mechanical oscillator, Sonntag LA 1.

Vibration is created by means of eccentrically supported weights, rotated so that all forces add in one direction and cancel each other in all other directions.

The machine weighs 61 lb. and is attached to the structure being tested. It will provide a direct force of 1,600 lb. (with stepless micrometer adjustment). Resonance is then used to multiply this force and for structures with low damping, a figure of 320,000 lb. has been recorded.

The oscillator has two drives for its motor, a flexible shaft and a V-belt drive and there is also a control cabinet and desk.

Neutral Atmosphere Generator. For producing neutral atmospheres for such operations as furnace brazing, bright annealing, hardening, sintering of high-carbon ferrous metals, etc., the General Electric Co. of America has developed a producer for what is termed "Neutralene" gas. A typical "Neutralene" mixture is nitrogen 73%, hydrogen 15%, carbon monoxide 10.5% and methane 1.5%.

The unit consists of a combined combustion chamber and reactivating tower; an absorbing tower to remove carbon dioxide, a gas cooler, a heat exchanger and a liquid cooler. For drying the gas a refrigerated cooler and activated aluminia dryer are furnished.

Diamonds for Plastic Cutting. Although moulding is satisfactory for many purposes, it is sometimes necessary to machine plastics for extreme dimensional accuracy. Owing to the abrasive action of some plastics or their fillers, steel tools need frequent sharpening or replacement and diamond tips are said to be much better. For precision machining, most plastics require to be "aged" for at least 24 hours and where maximum accuracy is wanted, 6 weeks may be necessary.

Industrial Adhesive. A new adhesive for use on plastics, synthetic and natural rubbers, metal foils, metal-to-wood etc., has been introduced by the duPont de Nemours Co.

No catylist is needed and the new product called adhesive No. 4665, can be applied by dipping, brushing and roller or knife coating. It is resistant to dilute alkalis and acids. Continuous immersion in water will reduce the strength of the cement but the loss is regained in drying.

Electroplating guard coating. A new solution for protecting racks used in electroplating and pickling has been announced by the B.F. Goodrich Co. It is a white, opaque and glossy coating known as Korolac 2500 and is used with a special primer to increase adhesion.

Porosity elimination in molten metal. To eliminate the porosity which is caused by dissolved hydrogen, a method has been developed of "flushing" the molten metal with dry argon or nitrogen. It is claimed that the process reduces the number of casting rejects due to prosity.

Automatic dilatometer for thermal expansion. An automatic dilatometer for the continuous recording of the thermal expansion and contraction of a wide range of materials has been put on the market by Sylvania Electric Products.

The equipment is designed to give a continuous record of 12-hour expansion and contraction cycles and except for set-up time needs no attention.

A furnace or sub-zero cooling chamber is included in the apparatus; also all the ancilliary equipment. The temperature of a specimen is held constant to within 1° C. and the heating and cooling may be in an inert atmosphere if desired. Specimens up to 5 in. in length may be accommodated and the overall accuracy is 0.2%.

Temperature Controller. Temperature variation control within 1/5 of a degree F. is claimed for a new small unit made by C.S. Gordon in America. According to the manufacturer this unit will prevent overshoot and undershoot temperature variations prevalent in the plastic, moulding, tempering, aluminium heat-treating and other fields.

PLANNED PRODUCTION DRIVE MAKES AVAILABLE MACHINE TOOLS for IMMEDIATE DELIVERY

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Continued from page 55

value of the mean anode current, which can be indicated on a milliameter. It follows therefore that variation of the R.F. resistance will produce a change in the indication of the meter.

In the micrometer shown in Fig. 2, an adjustment of the mechanical member alters the distance between the plates of a variable condenser, and thereby changes its capacitance. This has the effect of varying the R.F. resistance, and consequently the reading of a milliameter.

The scheme illustrated in Fig. 2 is, of course, only basic. Practical arrangements involve several stages of valve amplification, and provide for adjustment of inductance and capacitance to give the instrument a wide range. The direct current for operating the valves is usually derived from electronic or other types of rectifier.

Apart from micromety a variety of mechanical displacement measurements can be made by methods involving changes of inductance or capacitance.

It should be noted that the principle of the oscillating system is used for generating high frequency voltages for eddy-current and dielectric heating.

An important group of electronic measuring instruments makes use of changes in light intensity that produce an electrical change in a photo-cell.

For temperature measurements above 750 deg. C., has the major advantage of instantaneous response to change of temperature. It consists essentially of a photo-electric cell in a suitable housing, often water cooled as in Fig. 3, arranged to view the hot body.

The small photo-electric currents, which are a measure of the radiation received, are amplified to a value for operating a robust type of indicating instrument.

Photo-electric pyrometers can be applied for measuring and recording the temperature of objects while they are moving, such as an succession of objects on a conveyor. Fig. 4 shows the application of a pyrometer for indicating and recording the temperature of billets before rolling.

Control of temperature can also be effected either by photo-electric or other forms of electronic regulators. For low temperatures a resistance thermometer connected in a bridge circuit is used with an electronic amplifier.

The electronic techniques of measurement described are only a few examples of what can be done. It is true to say that almost any measurement can be made, so that it is always advisable to investigate possibilities when it is required to improve upon existing methods.

Continued from page 64

heel people, had some in 1941 but owing to shortage of materials they were not used until 1946 but they were as good as ever in effect.

So that was what was so familiar about that particular transfer. We remembered having seen the design on shop doorways etc., but until we saw it in company with others we again hadn't realised it was a transfer.

We left Mr. Burgess, his desk heaped high with transfers of all sorts and sizes, the aftermath of our search for the most suitable specimens for reproduction, and as we journeyed back to town we kept an eye open to see just how many Trapinex transfers we could recognise. The results surprised us and we came to the conclusion that we must have been singularly unobservant not to have seen them before, or were we ? Was it not perhaps as our host told us, they were so good that you just don't realise you are looking at them.

A LETTER FROM OUR POST-BAG

To the Editor of " Mass Production."

Sir,

Most workers have little understanding of our complex economic situation. Thus there is no enthusiasm for increased production of goods for export which they themselves urgently need in their homes.

Manufacturers might arouse enthusiasm by imaginative displays in factory and workshop of facts and charts which bring home to the employee the relationship between internal and external economics. In a car factory, for example, there could be large illustrated charts showing that " This car is going to India in exchange for the tea you drink at the canteen and at home. It will buy 10,000 lbs. of tea—the ration this week for 80,000 people." Similar illustrations could be given in all factories engaged on export work.

Until workers are enabled to realise that their bread and butter literally depends not on shorter hours and higher wages but on increased output, the Government's export targets will remain a mirage.

Yours faithfully,

KELLAWAY TARLING,
Organising Secretary,
Industrial Christian Fellowship,
1, Broadway, Westminster,
London, S.W.1.

By Our Market Correspondent.

The Commodity Markets

Indications Favouring Manufacturers

THE result of the interplay of all the forces connected with commodity price movements defies accurate prediction and, at the risk of reiteration, it must again be mentioned that the trend depends to a major extent upon America. The efforts of the Truman Administration to check the continued rise in U.S. prices are of importance in connection with the crusade for helping European impoverishment. If the Marshall plan had not been announced, the quotation for commodities and metals would almost certainly be downwards.

So far as our own domestic position is concerned, although the outlook for a lowering range of values is not illuminated by any particular brilliance of hope, there are certain domestic indications favouring manufacturing interests. Steel and coal output are moving in the right direction to influence an easing tendency, while the position of some commodities is less tight than it was. This is consequent upon currency shortage restricting overseas demand and any additional supplies therefore should be in favour of consumers.,

The Ministry of Labour's retail price index which is announced monthly, has not varied greatly since the base date of 17th June last year (taken at 100). It has since moved up, according to the last return about 1 point.

Buying Metals.

Although nothing further has come about regarding the re-opening of the London Metal Exchange, it is believed by the cognoscente that this year will see its re-start. The view has been expressed that its functioning would be a most beneficial measure to producers and consumers alike. Meantime Government bulk buying continues.

There has been a small increase in New York COPPER export quotation, which is still the world price. Although it is only small, it is quite significant as regards effect on the ruling quotation here. The British Ministry of Supply, remains the great uknown in the copper market and is believed to be fairly well bought; its selling price, £132 per ton (electrolytic)—which need have little short-term relation to its buying price—must ultimately be governed by the world level.

TIN and the U.S.—Bolivian pact has been the most outstanding matter of comment amongst both producers and users of the metal. The rise in price has lagged far behind the increase in that of lead, zinc and copper; it has appreciated 90% compared with an increment of 400% in the price of Lead, for instance. For some time the Tin Producers' Association has advocated the Ministry of Supply divorcing itself from the bargaining of the Bolivians and establishing a fair and just price for the tin it buys all over the world, including Bolivia.

Lead for Export; Zinc.

Although the supply position of lead continues to be difficult, the Government has found it possible to set aside a small quantity for export to certain selected markets in response to commercial orders. These are additional to those licensed under present arrangements in respect of orders sponsored by dominion or Colonial Governments or by Government Departments in this country. Lead (foreign duty paid), is quoted at £90 per ton.

The price of ZINC (foreign duty paid) is £70 per ton. According to the Zinc Development Association's statistical review, consumption of metal for zinc alloy die castings has risen to 3,300 tons a month—a rise of about 1,000 tons a month. On the other hand production has fallen in America but increased in Europe.

There is little doubt that, in its quiet way, the U.S. has been taking zinc off the market as it has of other metals—manganese, nickel, vanadium, cobalt, columbium, etc. The American Government does not blow a trumpet when it starts to buy; there is little hard news of its activities but its support for metals is part of its programme.

Iron and Steel.

According to the British Iron and Steel Federation, the steel output in 1948 promises to be in the neighbourhood of 13,000,000 tons, and the industry hopes to export 1,750,000 tons. Welling confidence is being displayed and so remarkable is progress that even these figures may be improved upon; indeed, a target of 14,000,000 tons is being spoken of. Every effort is being made to encourage the quick return of scrap by the large industrial users of steel; one million tons of scrap will, it is hoped, be obtained from Germany.

Among the non-ferrous metals, the call for ALUMINIUM this year will, it is estimated, far exceed that of last. The price of virgin ALUMINIUM in notch bar form is now £80 to £82 10s. per long ton delivered into consumers' works. It was increased last November when it was pointed out that the higher price reflected the additional cost of the metal in notch bar form.

With steel requirements at their present high level, the demand for MANGANESE is brisk and the fact that private demand is so strongly supplemented by public demand is an added assurance to its continued call.

TUNGSTEN—one of the heaviest metals—is being well supported and is quoted £6 7s. 6d. to £6 15s. 0d. per unit.

On account of printing exigencies, Commodity prices and indices mentioned above were struck on a certain day during the month; alteration in price movements since then must be allowed for.

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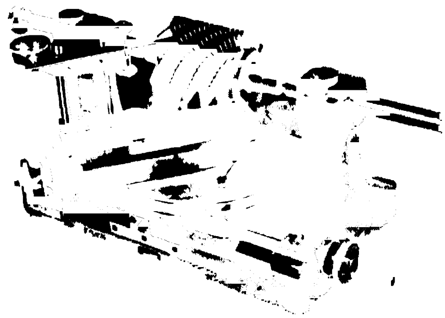

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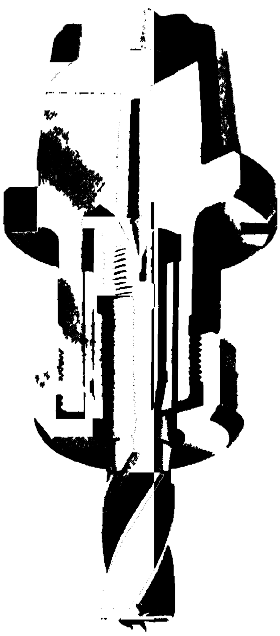
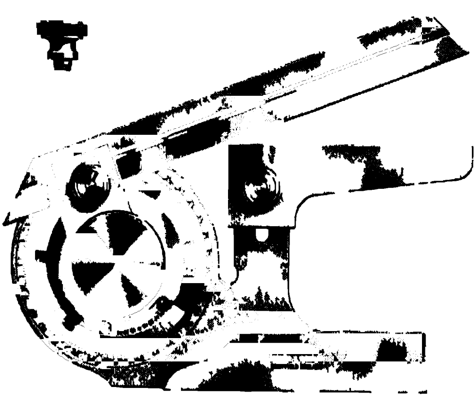


Sectional view of the Clarkson Auto lock chuck for holding milling cutters

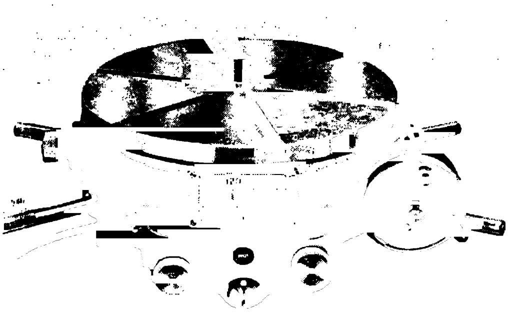
GAUGE & TOOL EXHIBITION

In order to preserve the continuity of our Exhibition Supplement and to ensure that it was complete in itself and capable of being removed intact, it became necessary to exclude photographic illustrations from the text. Space still prevents us from showing as many items as we should like but we offer a selection of the most interesting on these two pages. Others will appear in our next issue.



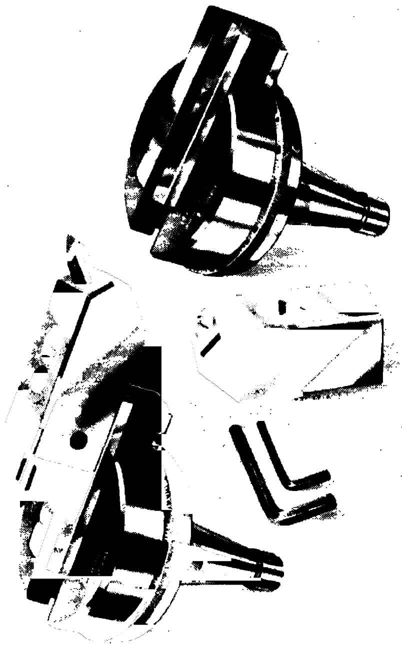
Moore & Wright vernier bevel protractor with acute angle attachment

A. C. Wickman's new Cornelius electronic comparator

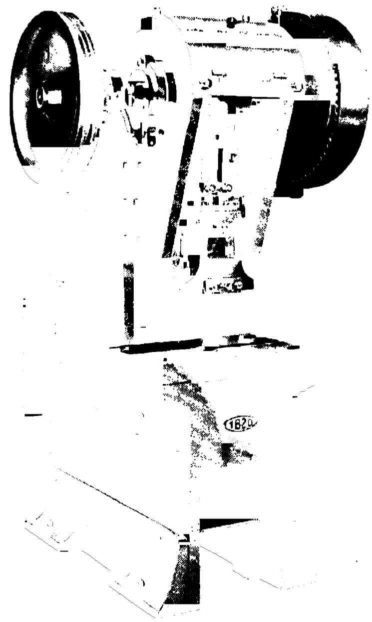


O.M.T. rotary and inclinable table by Optical Measuring Tools Ltd.

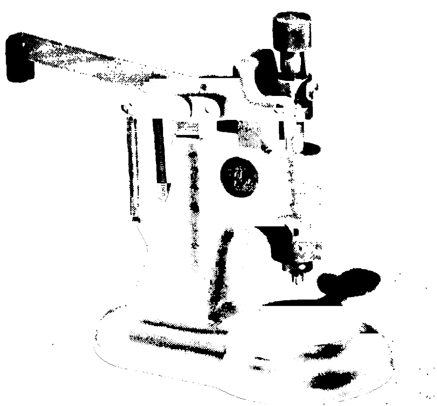
An interesting shoulder gauge by Weir Precision Engineering Co. Ltd.



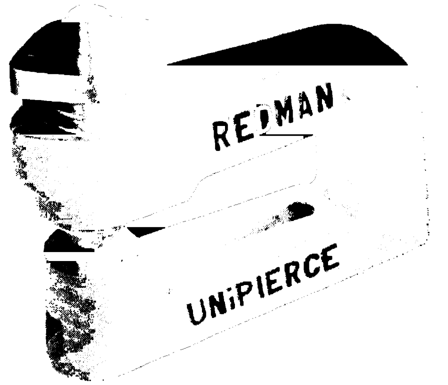
The "Interslide" precision boring head by Lushington Tool Manufacturing Co. Ltd.



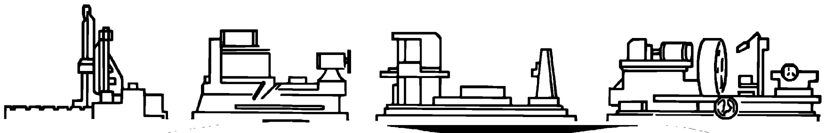
The T.B. 20 press shown, along with a larger model by Turner Bros.



Precision jewel setting press by Birmingham Gauge & Tool Co. Ltd.



The Redman "Unipierce" tool and holder for use on press brakes.



WARDS *might have it!*

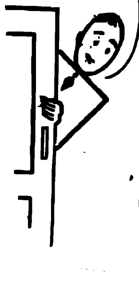
The suggestion that WARDS might have just the equipment you need is a broad general reminder that Lathes, Shapers, Millers, Drillers, Planers and so on of many types, new, used or reconditioned, are usually on offer at one or another of WARDS' machinery showrooms.

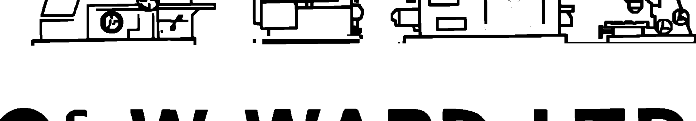
It also quite regularly applies to other less commonplace machine tools. For example, we have in stock at the present time the following items :—

One secondhand Bullard 24″ Rapid Production type Vertical Boring and Turning Mill, with graduated hexagon toolpost, dia. of holes in turret 2¼″, traverse of toolpost on cross slide 16″, max. dist. from underside of toolpost to table 19½″, with a balanced side head fitted with 4-way toolpost, arranged for single pulley drive 12″ dia. x 3″ face, 15 table speeds from 10—89 r.p.m. (table chuck jaws not available).

Asquith Patent Horizontal 'One-cut' Cotterway Drilling and Milling Machine, type H.K.4. ; capable of milling slots up to ⅜″ wide x 3″ long through 1⅛″ dia. ; minimum cotterway cut 3/16″ x 1″ ; maximum dia. of work piece accommodated 1⅛″ ; height of spindle centres 2″ ; spindle speeds 750, 1050/1500 r.p.m.; the slotted table 12″ x 6″ Motor drive including English Electric motor 400/440 volts, 3 phase, 50 cycles, 1410 r.p.m.

These are available for immediate delivery at the time of writing, and may still be available as you read.





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Forthcoming

M.O.S. AUCTION SALES

Date.	*Site of Sale.*	*Auctioneer.*
	Miscellaneous Stores.	
Jan. 6th to Jan. 9th.	M.O.S. Depot 1, Royal Arsenal, Woolwich.	Harold Williams & Partners, 80, High Street Croydon. Tel. . Croydon 1931.
Jan. 6th to Jan. 9th.	M.O.S. Depot 45, Cannel Street, Ancoats, Manchester.	J. H. Norris & Sons, 9, Albert Square, Manchester, 2. Tel. : Blackfriars 8373.
Jan. 13th to Jan. 15th.	M.O.S. Depot 150, Ramsbury Airfield, Ramsbury, Wilts.	Hooper, Pinniger & Co., 130, High Street, Marlborough, Wilts. Tel. : Marlborough 41.
Jan. 14th to Jan. 16th.	M.O.S. Depot 120, Gillbrow Barnoldswick, Yorks.	D. Waterhouse & Nephews, Britannia House: Bridge Street, Bradford. Tel. : Bradford 10888.
Jan. 20th to Jan. 22nd.	M.O.S. Depot, Maddingley Road, Cambridge.	R. C. Knight & Sons, Market Place, Stowmarket Tel. : Stowmarket 384/5.
Jan. 21st to Jan. 22nd.	M.O.S. Depot 158, Stratford Airfield, Atherstone-on-Stour, Warwick.	Walker Barnard & Son, 47, Sheep Street, Stratford-on-Avon. Tel. : Stratford-on-Avon 2581.
Jan. 21st to Jan. 22nd.	M.O.S. Depot 99, Weyhill, Andover, Hants.	Henry Butcher & Co., 73, Chancery Lane, W.C.2. Tel. : Hol. 8411.
Jan. 21st to Jan. 23rd.	M.O.S. Depot 127, Longtown Aerodrome, Nr. Carlisle.	Harrison & Hetherington Ltd., 147, Botchergate Carlisle. Tel. : 1792/3.
Jan. 27th to Jan. 28th.	C.O.D., Didcot, Berks.	Wheatley, Kirk, Price & Co., 2, South Audley Street, W.1. Tel. : Reg. 7150.
Jan. 27th to Jan. 30th.	M.O.S. Depot 119, Knottingley, Yorks.	Bentley & Sons, Knottingley, Yorks. Tel. Knottingley 47.
Jan. 29th to Jan. 30th.	M.O.S. Depot 77, Dundonald Aerodrome, Drybridge, Ayrshire.	S. Lipsey, 50, Wellington Street, Glasgow, C.2 Tel. : Glasgow Central 7930.
	Miscellaneous R.A.F. Stores and Equipment including Small Tools.	
Jan. 7th to Jan. 8th.	R.A.F. MU. No. 14, Carlisle.	Harrison & Hetherington Ltd., 147, Botchergate, Carlisle ; and H. E. Winter & Sons, 14/20, Lonsdale Street, Carlisle. Tel. : Carlisle 1792/3 & 237.
Jan. 14th.	R.A.F. MU., No. 66, Cuckney, Mansfield.	W. T. Parker, 1, Market Place, Mansfield. Tel. : Mansfield 249.
Jan. 14th to Jan. 15th.	R.A.F. MU., No. 61, Sub-suite Granage, Nr. Middlewich, Cheshire.	Brady & Son, 17, Warren Street, Stockport. Tel. : Stockport 2252/3.
Jan. 19th to Jan. 23rd.	R.A.F. M.U., No. 263, Stansted Mountfitchet, Essex.	Sworder & Sons, 15, North Street, Bishop, Stortford. Tel. : Bishops Stortford 692/3.
Jan. 29th to Jan. 30th.	R.A.F. MU., No. 262, Eccles, Norwich, Norfolk.	T. W. Gaze & Son, Crown Street, Diss, Norfolk. Tel. : Diss 13.
Jan. 26th to Jan. 29th.	R.A.F. MU., No. 25, Hartlebury, Kidderminster.	Nock & Joseland, Bank Buildings, Kidderminster, Tel. : 2053.
	Vehicles, etc.	
Jan. 6th to Jan. 14th.	M.O.S. Depot, Mount Farm, Dorchester, N.. Oxon.	Simmons & Sons. 12, Station Road, Reading. Tel. : Reading 4025/6.
Jan. 19th to Feb. 19th.	No. 22 V.R.D., Cornbury Park, Charlbury, Oxon.	E. P. Messenger & Son, 4, King Edward Street, Oxford. Tel. : Oxford 47281.
	Trailers, Trolleys, Pedal Cycles and Miscellaneous R.A.F. Stores.	
Jan. 12th to Jan. 14th.	R.A.F. MU., No. 255, Sub-site, Balderton, Nr. Grantham, Lincs.	Escritt & Barrell, Elmer House, Grantham, Lincs. Tel. : Grantham 1035/36.
	Miscellaneous R.A.F. Stores and Equipment, mainly Electrical and Photo.	
Jan. 20th to Jan. 21st.	M.O.S. Depot, Thorp Arch, Nr. Boston Spa, Yorks.	Bartle & Son, 5/6, Corn Exchange, Leeds. Tel. : Leeds 24628.
Jan. 20th to Jan. 22nd.	R.A.F. MU., No. 3 Sub-site, Kingston-Bagpuise, Berks.	Adkin, Belcher & Bowen, 10, High Street, Abingdon. Tel. : Abingdon 25.
Jan. 20th to Jan. 22nd.	R.A.F. MU. No. 7, Quedgeley, Glos.	J. Pearce Pope & Sons, St. Aldgate Chambers, Glos. Tel. : Glos. 2274.
	Photo., Electrical, Drawing office Equipment, Hand Tools and Miscellaneous Stores.	
Jan. 27th to Feb. 6th.	M.O.S. Depot 121, Ashchurch, Glos.	Bruton Knowles & Co., King Street, Glos. Tel. Glos. 2267 ; and George Hone, High Street Tewkesbury. Tel. : Tewkesbury 10.
	Radio Components, Electrical Equipment and Miscellaneous R.A.F. Stores.	
Jan. 7th to Jan. 9th.	R.A.F. MU., No. 265, Grove, Wantage, Berks.	Adkin, Belcher & Bowen, Market Place, Wantage. Tel. : Wantage 48 ; and Hobbs & Chambers, Farringdon, Berks. Tel. : Farringdon 2113.
Jan. 27th to Jan. 28th.	M.O.S. Depot, White City, Shepherds Bush.	Leopold Farmer & Sons, 46, Gresham Street, E.C.2. Tel. : Mon. 3422.
Jan. 28th to Jan. 29th.	M.O.S. Depot 123, Norton Fitzwarren, Taunton.	W. R. J. Greenslade & Co., 3, Hammet Street, F. L. Hunt & Sons, 9, Hammet Street ; A. W. Parker & Co., 52, East Street. Tels. : Taunton 2601 ; 2742 , and 2101.

Although it is anticipated that these sales will take place on the dates shewn, they should be taken as *tentative* but the change of dates, if any, will only be a few days.

Lists of the type of stores to be included in the sales are not yet available, in the majority of cases they will be of a miscellaneous character : Electrical, Mechanical Plant and Equipment and Textiles, at each sale.

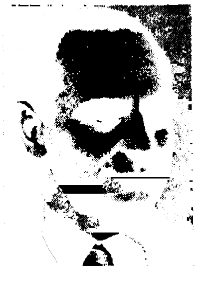
PERSONALITIES

The retirement at the age of 67 is announced of **Mr. H. Landstad,** the designer of the first Morris car engine and one of the original directors of Morris Motors, Ltd. He first became identified with Morris interests in 1912 when, as chief designer of White & Poppe Ltd., and in collaboration with Mr. Poppe and Mr. Morris, as he was then, he designed the first Morris 10 h.p. engine which went into production for use in the first Morris Oxford car the following year. In 1914 he joined W. R. Morris and together they designed the Morris Cowley engine.

The Metropolitan-Vickers Electrical Co., Ltd., announces that **Mr. J. Billington,** the Company's Purchasing Agent, retired on the 31st December, 1947, after 45 years service. He is succeeded by the previous Contracts Manager, **Mr. G. T. King,** and Mr. King's assistant, **Mr. H. Lawson-Jones, M.C., B.Sc. (Eng.)** now becomes Manager of the Contracts Department.

Mr. Thomas A. E. Bowen, Technical Art Adviser to Philips Electrical Ltd., was recently elected a Fellow of the Royal Society the Royal Society of Arts. Mr. Bowen is already a Member of the Society of Industrial Artists, and a Fellow of the Central Institute of Art and Design. A commercial artist with many years experience in all fields of printing reproduction, he joined the Philips organisation in 1940 as a designer draughtsman when he was chiefly concerned with radio and X-ray development.

E. S. Waddintgon, M.S.E., M.Inst. W., A.M.I.E. (s.a.), Associate I.E.E., of Philips Electrical Ltd., who is a Member of the Council of the Institute of Welding, has been elected Vice-chairman of the Finance Committee of that Institute.



Mr. James Sinstadt

Mr. Frank Gerrans, closely identified with the Industry for the past 30 years as Manager of Schrader's of Birmingham, manufacturers of Tyre Valves and Gauges and Industrial Air Control Equipment, has relinquished his post. His successor is **Mr. James Sinstadt,** formerly Manager of their Paris branch, and for the past 14 years Superintendent of the Birmingham Works.

H. A. Dell, B.Sc., A.R.C.S., D.I.C., employed by the Mullard Radio Valve Co. Ltd., on research and development work in connection with electronic instruments, has been awarded the degree of Doctor of Philosophy of the University of London for his thesis entitled " A Physical Investigation of the Properties of Thin Films used in the reduction of Surface Reflections from Lenses."

Mr. J. K. Redman, A.R.C.S., B.Sc. (London), A.F.R.Ac.S., of the technical department, Gloster Aircraft Co. Ltd. has been appointed chief technician to Dunlop's aircraft division at Foleshill, Coventry. He took his B.Sc. at the Royal College of Science (Imperial College of Science and Technology) and entered the aircraft industry after a post-graduate course in aeronautics, specialising in structures and aerodynamics. Mr. Redman, who is 36, has held appointments with A.V. Roe & Co., Ltd., and Messrs. Short Bros.

Mr. William Wood, General Manager of Thos. W. Ward (Coal) Longbottom Limited, Harvest Lane, Sheffield, has been appointed Assistant Managing Director.

Mr. Ashley S. Ward, Chairman of Thos. W. Ward Ltd., and other associated companies, has relinquished the Chairmanship of Lowmoor Best Yorkshire Iron Ltd., and **Mr. George Wood** (Deputy Chairman of Thos. W. Ward Ltd.) has been appointed in his place. Other changes on the Board of this company include the election of **Mr. C. L, Fry** and **Mr. W. W. Hickman** as directors and the appointment of **Mr. Fry** and **Mr. R. Stubbs** as joint managing directors. The position of works manager has been taken over by **Mr. G. F. Hanson.**

Mr. Stanley J. Dyal has been appointed a Director of Thos. W. Ward Limited. Mr. Dyal has had a long and interesting connection with the Company and has been Chief Valuer for many years. His activities have been mainly concerned with industrial development and dismantling.

Edgar Allen & Co., Ltd., regret to announce the retirement of their representative, **Mr. A. E. Taylor,** on the 31st December, 1947. Mr. Taylor has been connected with Edgar Allen & Co. Limited for 44 years. His territory covers a large area in the East Midlands, his headquarters being in Leicseter. Mr. Gilbert **Francis** is to succeed him in the area.

The retirement, owing to ill-health, of **Mr. J. L. Graham,** Dunlop director of overseas sales was recently announced. Mr. Graham, who is 61, joined the Company as assistant manager in Italy 29 years ago. He will remain available as a consultant on all export questions.

Mr. E. A. Langham has relinquished his appointment as Sales Manager, in the Sales Division, to take up a new appointment as General Manager for The British Aluminium Co. Ltd. in India. Mr. Langham left this week for India. **Mr. A. W. Langham,** who has been Manager of the Sales Planning Department, will, for the present, undertake responsibility for Sales as well as Sales Planning Departments in the Sales Division, with the title of Sales Manager.

G R

By Order of the Minister of Supply.

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without reserve, at the above Depot, on **Wednesday and Thursday, 21st and 22nd January, 1948,** at 10.30 a.m. daily—

A Large Quantity of Industrial and Electrical Equipment and Stores including:

2 Two ton mobile cranes [Ransome & Rapier, and Chaseside, with Lister and Fordson engines] ; 4, 15 ton Purchases $3\frac{1}{2}$ in. circular steel wire ; 600 single sheave blocks, $3\frac{1}{2}$ and 4 in. cordage ; 10 Concrete Mixers by well known makers with Bedford and Lister Engines; Gas and air compressors and drainers ; Welding sets ; 2 Treble Ram Pumps, trunk guide type single reduction gear, 8 and 10 in. stroke ; Avery one ton portable weighing machine ; 8 Boat Davit Guys 2 in. circular steel wires complete ; Towing steel wires circular up to 6 in. ; 167, 3 ton Bipcd legs 16 ft., $3\frac{1}{2}$ in. dia. steel tube ; 530 Gunmetal Valves $1\frac{3}{4}$ to 16 in. ; 364 Machine Vices, Tubular steel trucks, 270 sheet metal cooking stands ; also Surface plates, swarf skips, winches, and

10,500 feet of **Gravity Runway,** 15 in. width, 4 in. pitch, $2\frac{1}{2}$ in. rollers ; Lined and other tanks, etc.

124 Electric Motors, .1 to 25 h.p., 230 to 400 volts, well known makes ; 150 h.p., DC motor with automatic panel ; transformers, motor starters, control equipment, meters, junction and fuse boxes, switches up to 400 amps., Electric Hot Cupboards ; DC. generator set complete ; 50 Battery machines ; De Laval Oil Heating tank and equipment, Electric Hardening Furnaces,

and Major barrel for Cadmium plating, 440 volts $\frac{1}{4}$ h.p. motor, etc.

Viewing, Monday and Tuesday, 19th and 20th January from 9 a.m. Catalogue 6d. will be available about 10th January, 1948.

Remittances and enquiries to the **Auctioneers** at

Botchergate, Carlisle. Phones 1792/3. Telegrams " sales."

VICTA ENGINEERING COMPANY.

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- Portable and Stationary Compressors.
- Welding Plants and Spot Welders.
- Industrial Petrol Engines, $1\frac{1}{2}$ to $4\frac{1}{2}$ h.p.
- Pulleys, Flat and " V " 2 in. to 15 in.
- Alternators and Generators.
- House Lighting Plants.
- $\frac{1}{2}$ in. to 3 in. Capstans.
- Cylindrical and urfaces Grinders.
- Fly Presses of all types.
- Power Presses, 2 to 6 tons.
- Electric Motors $\frac{1}{4}$ h.p. to 30 h.p.
- Wood-working machinery.
- Armstrong Diesel Engines, 6 h.p.
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24 in. gauge Light Rail Track, 20-lb. section F.B. Rails. mounted on Steel Sleepers. Complete with fishplates. In 6 yd. lengths.

1-ton PARKER HOIST, mounted on 2-ft. gauge. Turntable Bogie. Without motor.

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INGERSOLL RAND Three-Stage Air Compressors. Maximum pressure 2,000 per s.i. Output 20 c.f.m.

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SITUATIONS VACANT.

Works Engineer with experience of electrical, steam, hydraulic and high-pressure gas compressors. Applicants should possess administrative ability and would be required for a medium-size rubber factory in the Greater London area. Write in the first instance with details of experience and salary expected. Box No. 503, Mass Production, 4, Ludgate Circus, London, E.C.4.

Experienced foreman for small parts precision presswork in South Wales. Good wages and prospects. Living accommodation available. Box 502, Mass Production, 4, Ludgate Circus, London, E.C.4.

Manufacturers of metal cycle accessories seek experienced foreman for press production and assembly for South Wales. Box 501, Mass Production, 4, Ludgate Circus, London, E.C.4.

WANTED.

Production Manager under 40, for brush factory at Hemel Hempstead, Herts. Experience of modern production methods essential. Write stating age, salary, experience, to the Secretary, G. B. Kent & Sons Ltd., 24, Old Bond Street, W.1.

High Frequency Induction Heating. Immediate capacity available for case hardening, tempering, shrink fitting, soldering and brazing, in large quantities. Apply Surfacings Department, Commercial Structures Limited, Staffa Road, Leyton E.10.

FOR SALE.

About 4,000 Pneumatic Hand Tools, comprising Drills, Hammers and Riveters (3/16in.—1in.) by most of the best makers. They show big savings on current prices. Write for illustrated list to Box 2207, G.T.C., 82-94, Seymour Place, London, W.1.

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Without Reserve

ASHCHURCH, GLOS.

[Within 2 miles of Tewkesbury and 7 of Cheltenham].

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GENERAL STORES

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Electrical Equipment.

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Century and Simplex C/W Sound Heads.

Spool Boxes and other Accessories.

Weighing Machines and Weights.

50 Steel Frame Shelters.

Steel Banding Trucks and Equipment.

Drawing Office Equipment, Drawing Boards, Tracing Tables, Inks and Paper.

Light Trailers, Sack Trucks.

Large quantity of Hand Tools, Saws, etc.

Auctioneers :

Bruton, Knowles & Co.

in conjunction with

George Hone.

Sale Days : **Tuesday, Wednesday, Thursday and Friday, January 27th, 28th, 29th and 30th. February 3rd, 4th, 5th and 6th, 10th and 11th.** at 11 o'clock punctually each day.

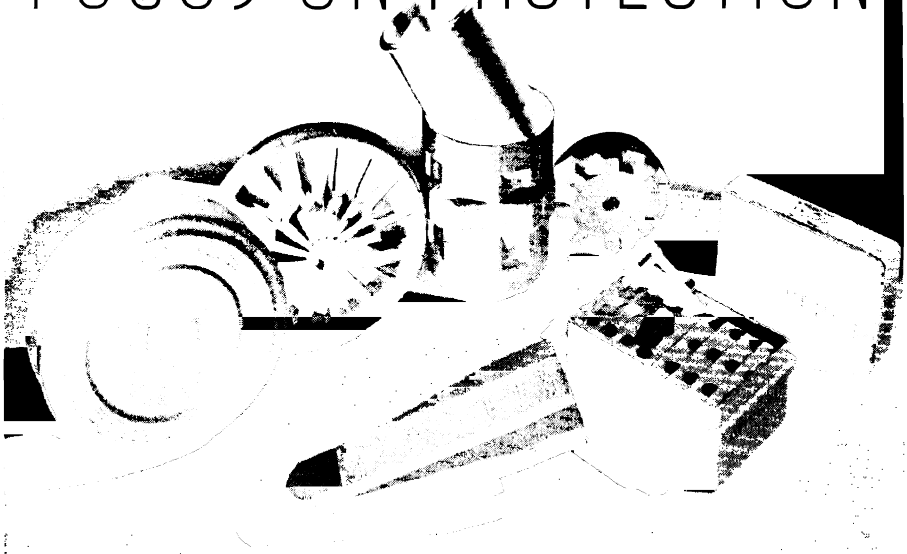
View Days : **Thursday and Friday, January 22nd and 23rd. Monday, January 26th and Monday, February 2nd and 9th.** From 10 a.m. to 4 p.m., and on Sale days from 9 a.m. to 10.30 a.m.

Catalogue : covering complete sale, price 6d [postal orders **only**], may be had of the Auctioneers, **Bruton, Knowles & Co.,** Albion Chambers, Gloucester [Telephone Gloucester 2267], or of **George Hone,** Tewkesbury [Telephone Tewkesbury 10].

Note : Applications for catalogues to be sent in envelope marked **Ash** top left hand corner.

Admission will be by Catalogue only.

FOCUS ON PROTECTION



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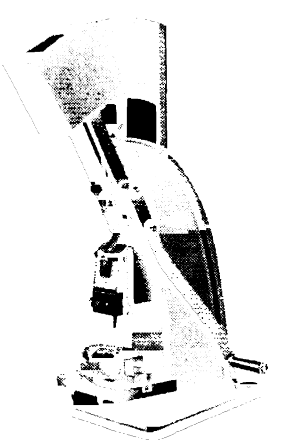
STANELCO

SINGLE ACTION BENCH

TOGGLE PRESSES



THESE bench presses have been designed for the production of small precision parts and the Toggle action reduces fatigue to a minimum

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Weight ...	130 lb.	Weight ...	80 lb.
Maximum Stroke	$1\frac{1}{8}$ in.	Maximum Stroke	1 in.
Size of Table	6 in. x 8 in.	Size of Table	7 in. x 5 in.
Overall Height	34 in.	Overall Height	$23\frac{1}{2}$ in.

Please write for further particulars.

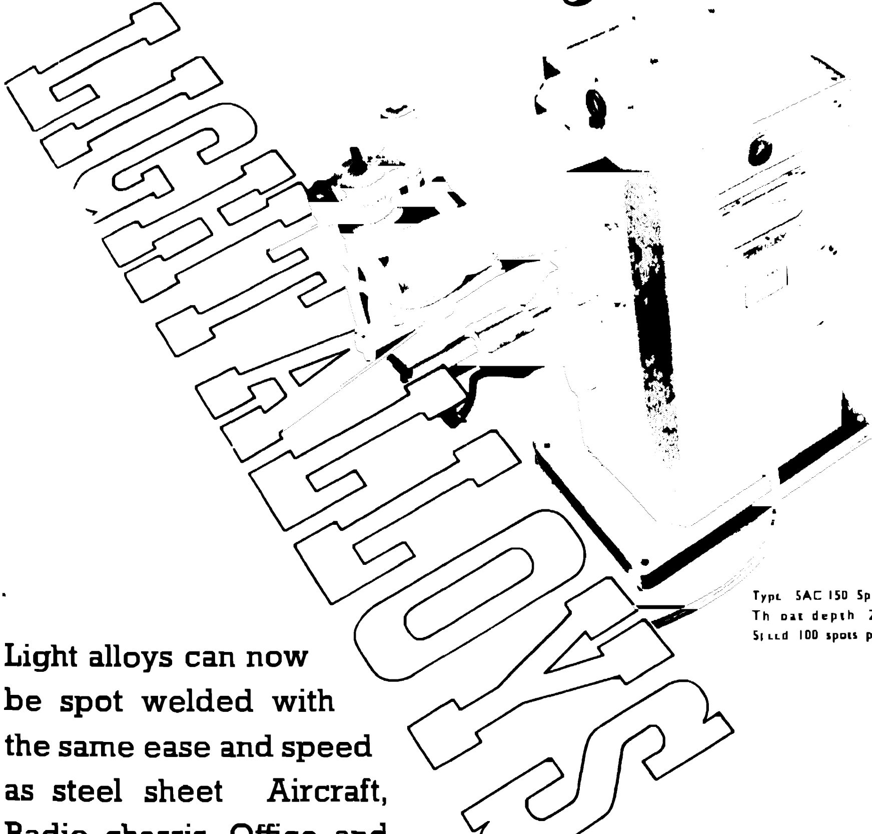
Standard Telephones and Cables Limited

(INDUSTRIAL SUPPLIES DIVISION)

CLINE ROAD, BOUNDS GREEN, LONDON, N. 11.

Telephone : ENTerprise 4461

Spot Welding



Type SAC 150 Spot Welder
Throat depth 24 inches
Speed 100 spots per minute

Light alloys can now be spot welded with the same ease and speed as steel sheet Aircraft, Radio chassis, Office and Domestic furniture, Motor car body panels, Kitchen utensils, Housing, etc.

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SLOUGH ENGLAND

BRITISH MADE TO MACHINE TOOL STANDARDS

SLOUGH 22342 3

SCIAKY ELECTRIC WELDING MACHINES LIMITED

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COMPRESSED AIR COOLERS

The SPIRAL FLOW principal has revolutionised the design and construction of Compressed-Air Coolers combining high efficiency with ability to withstand high pressures.

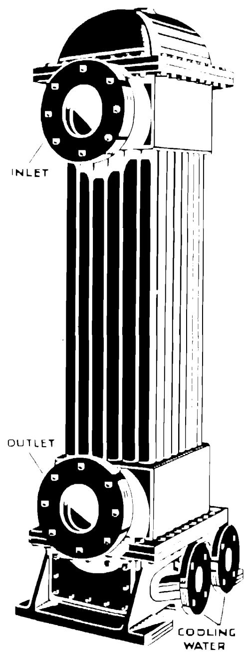
SPIRAL TUBE Compressed-Air Coolers are manufactured in sizes to suit Compressors up to 10,000 cubic feet of free air per minute, and pressures up to 600 lbs./sq. in.

The illustration shows an After-Cooler capable of cooling 600 cubic ft. of free air per minute to 90°F. when compressed to 100 lbs./sq. in., with water at 60°F. Overall size approximately 18" x20" x 54".

SPECIFICATION

The cooling block consists of cold drawn steel outer tubes and solid drawn copper inner tubes with continuous copper spiral gilling.
Air headers are of all-welded steel construction, and the water headers are of grey cast iron.

A SPIRAL TUBE PRODUCT



THE SPIRAL TUBE & COMPONENTS CO. LTD.

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How many Industrial Sidings are PLANNED as an *INTEGRAL* PART OF THE PRODUCTIVE ORGANISATION?

Many Industrial Sidings have, in the past, been extended or modified as was deemed expedient in the light of an Organisation's expanding requirements at various times. But piecemeal extension or modification does not produce maximum efficiency, and when calculated, operating costs per ton are frequently found to be excessive.

To operate with maximum efficiency and thus to justify fully the heavy initial expenditure, an Industrial Railway Siding must be planned and constructed to form an integral part of works and stores layout.

SUMMERSONS *Railway Siding* **ENGINEERS**

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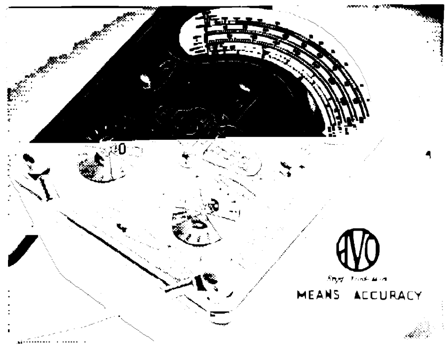

The 50-range Model 7 Universal AvoMeter.

B 30

We have just installed a HIGH FREQUENCY INDUCTION HEATING PLANT

Now that this plant has been added to our Surfacings Department we can give you very favourable quotations for —**Heat Treatment, Case Hardening, Shrink Fitting, Brazing and Soldering, Sintering, Melting—** or any job that needs a combination of these. High Frequency Induction Heating is quick, it's sure, it's controllable to very accurate limits of depth. It makes a better job—particularly on repetition work—and by saving finishing costs, saves money.
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"Why I support the SILVER LINING Savings Campaign"

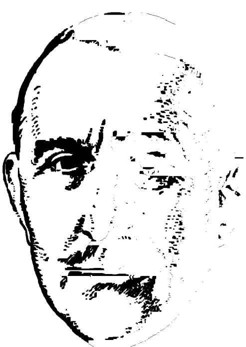
by J. Arthur Rank

"Many of you will remember the film made for Two Cities by Sir Laurence Olivier—Henry V. It was the story of a small and very tired British army, led by a courageous and determined king, in battle with a much larger enemy.

Today it is not an army that is in action: it is the whole nation. Like the soldiers in Henry V, and for the same honourable reasons, we are tired. And, like those soldiers, we need all our courage and determination to win this new battle.

We cannot all play as spectacular a part as our archers at Agincourt. But we all can make a tremendous contribution by supporting the Silver Lining Savings Campaign with all our resources and all our strength.

In this present crisis increased Savings will tell the world that we are determined to win."



National Savings for Prosperity

Issued by the National Savings Committee

INDEX TO ADVERTISERS

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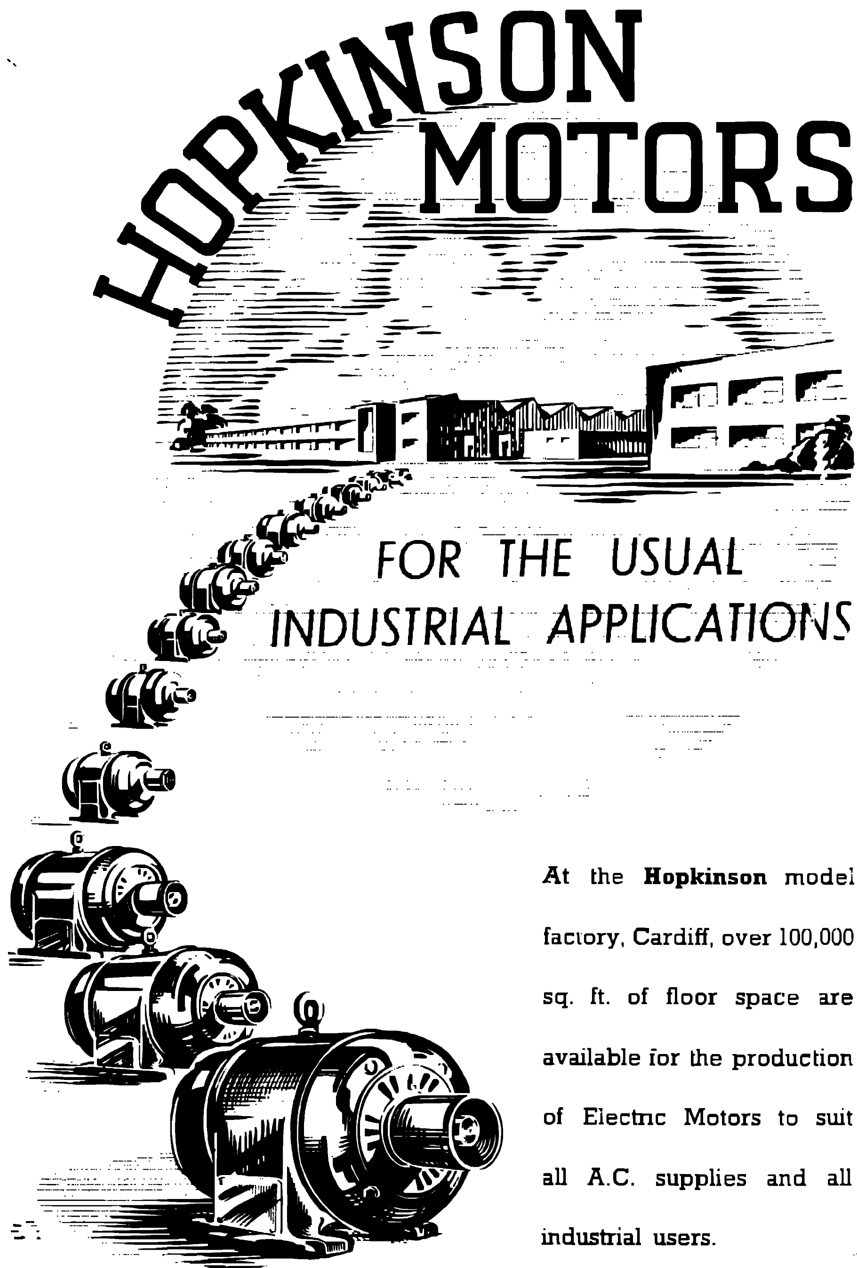
Avail yourself of new ideas and enquire for further details.

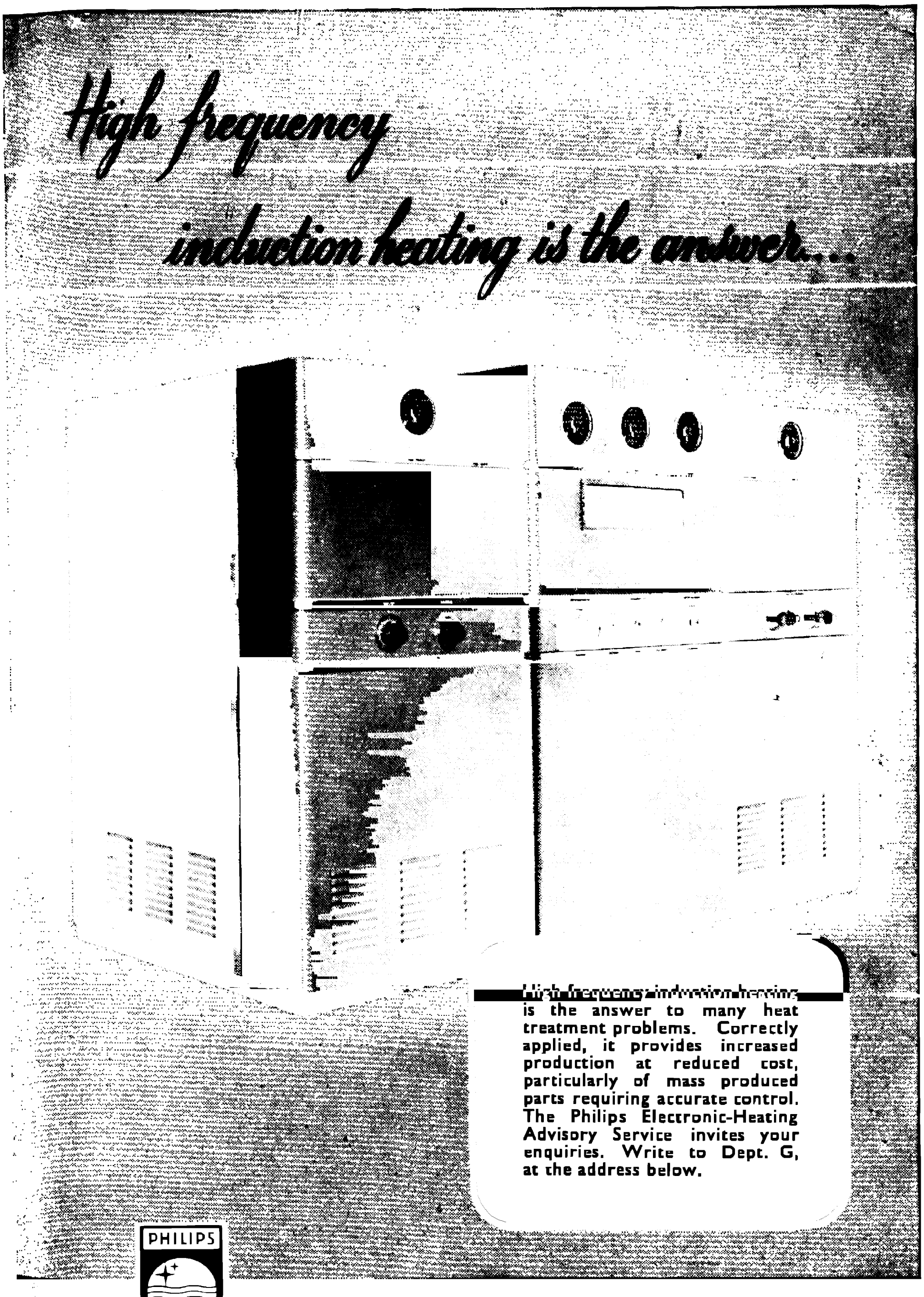


At the **Hopkinson** model factory, Cardiff, over 100,000 sq. ft. of floor space are available for the production of Electric Motors to suit all A.C. supplies and all industrial users.

HOPKINSON ELECTRIC COMPANY LIMITED

Head Office: Birchgrove CARDIFF Works at Cardiff and London

Telephone: WHITCHURCH (Cardiff) 1691-5 Telegrams: ORIGIMOTOR, CARDIFF



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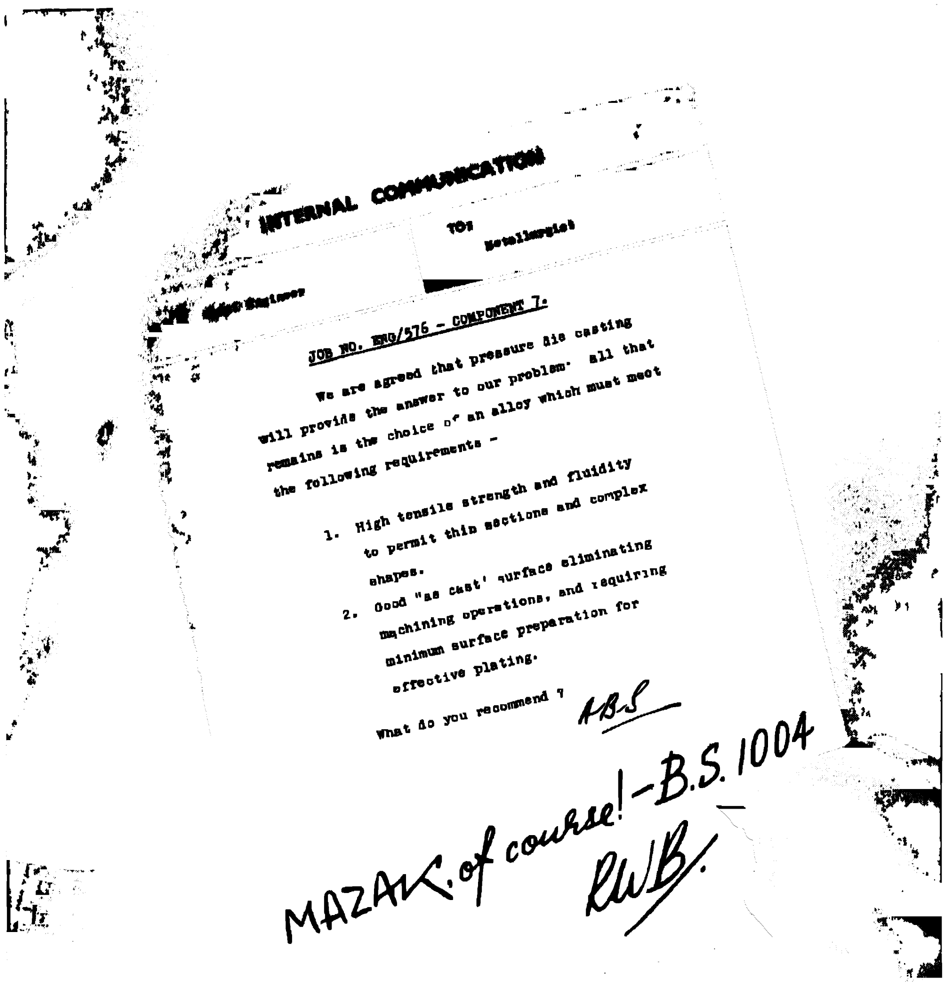
INTERNAL COMMUNICATION

TO: Metallurgist

JOB NO. ENG/576 - COMPONENT 7.

We are agreed that pressure die casting will provide the answer to our problem. All that remains is the choice of an alloy which must meet the following requirements -

1. High tensile strength and fluidity to permit thin sections and complex shapes.
2. Good "as cast" surface eliminating machining operations, and requiring minimum surface preparation for effective plating.

What do you recommend ? ABS

MAZAK, of course! - B.S. 1004
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STAMPINGS & PRESSINGS
IN ALL METALS AND FOR ALL TRADES
A Section of the W H B Factory
Up-to-date equipment skilled and experienced workmanship and a policy of steady progressiveness and rigid inspection combine to give W H B specialities their outstanding quality and excellent finish No operation is neglected to give perfection and we offer a service that satisfies
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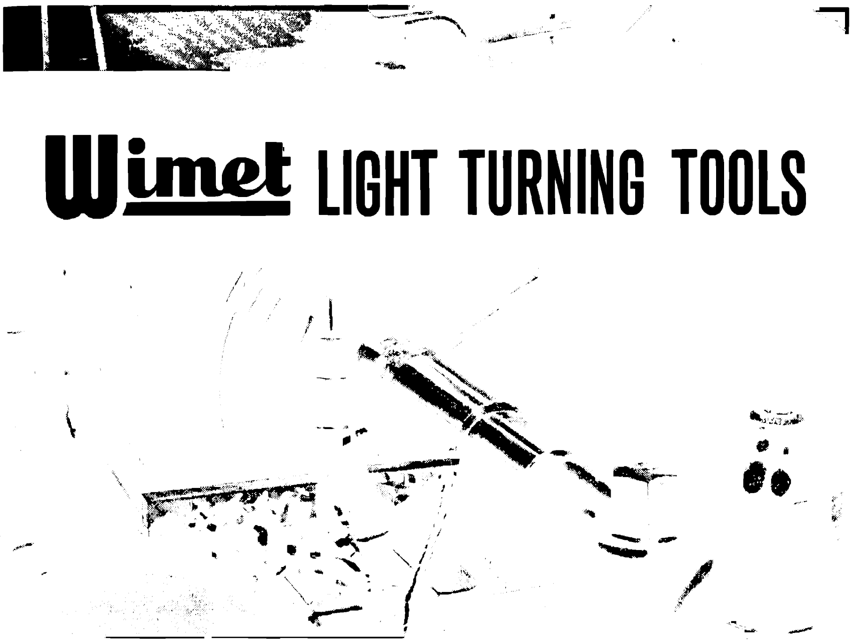
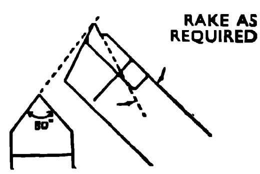
Wimet LIGHT TURNING TOOLS



for increased efficiency!

THE production of a flat chip requires less horsepower than the chip produced by a round-nose tool. This new light-duty tool has been developed therefore to exploit machine tools more fully by inducing the highest possible metal removal rate. Cast iron and most non-ferrous alloys are machined with tools having zero top rake, and a chip groove can be added on the appropriate cutting edge, at the same time forming a positive top rake, on tools required for cutting steels.

Wimet Light Turning Tools are stocked in various grades for cutting steel, cast-iron and non-ferrous metals.



This illustration shows the standard form of tool, available in a range from ⅜" sq. to 1" sq. Applicable for R/H or L/H operation, a chip breaker may be ground as shown with any desired angle of rake.

ANY QUESTIONS?
Write or 'phone for the Wimet specialist — always at your service.

It's all part of . . .

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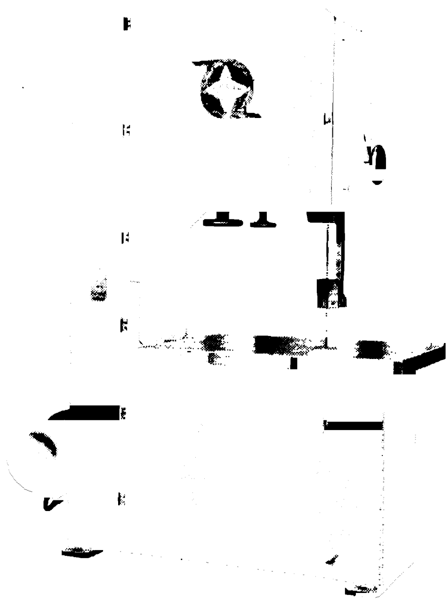


16,000 F.P.M. 180... M.P.H.

First demonstrated at the B.I.F. Castle Bromwich, the remarkably high running speeds and accurate cutting performance of the Midsaw HYSPEED Sheet Metal Bandsaw Machine made it an immediate success. Running at 16,000 feet per minute, equal to 180 m.p.h., the saw has 10 teeth per inch and therefore gives 1,920,000 teeth cuts per minute. Metal sheets are cut as quickly as they can be fed to it. The Midsaw HYSPEED will prove a real time and labour saver in all engineering shops where continuous high speed production is essential.

BRIEF SPECIFICATION :-

Large area table (48 in. x 36 in.), accurately machined and carefully mounted to control vibration and to ensure smooth cutting. The totally enclosed 8 h.p. Motor is of the Surface Cooled type, with drive taken by Vee Ropes. Saw Wheels. 36 in. x 2 in. Maximum depth under Guide. 25in. Special Saw Guides. Spring Saw Tensioning Device. Internal Hydraulic Brakes. All working parts are totally enclosed by a fabricated steel cover of modern design.

First class materials and workmanship throughout.

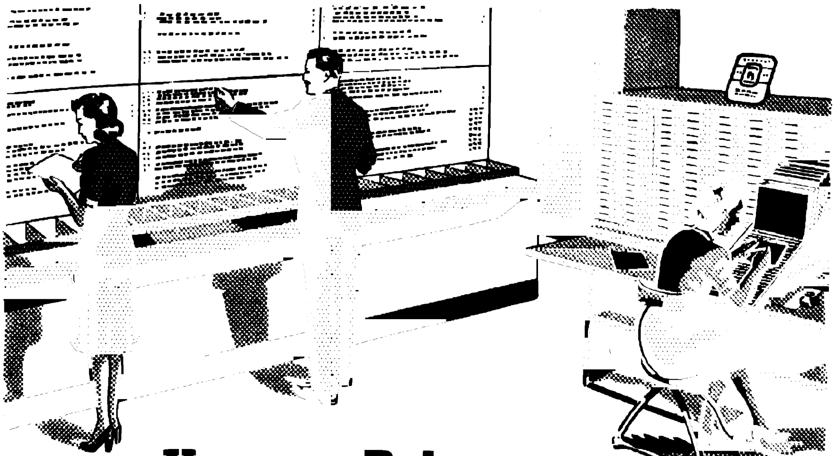
Write TO-DAY for full particulars.

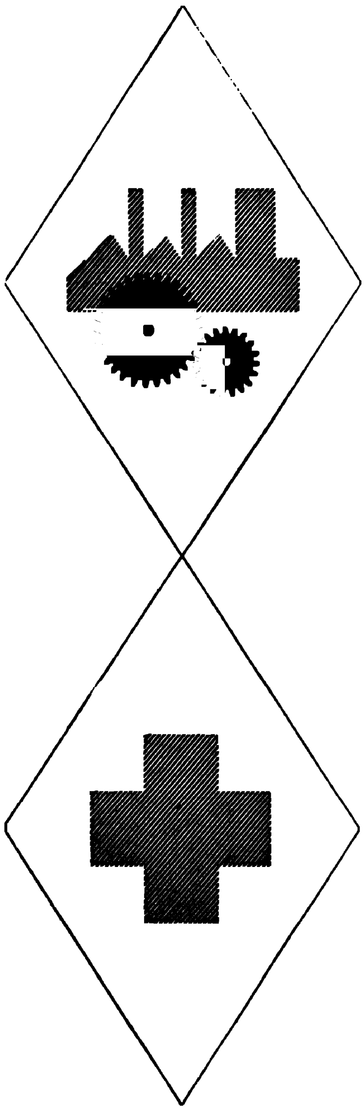
MIDSAW

HYSPEED

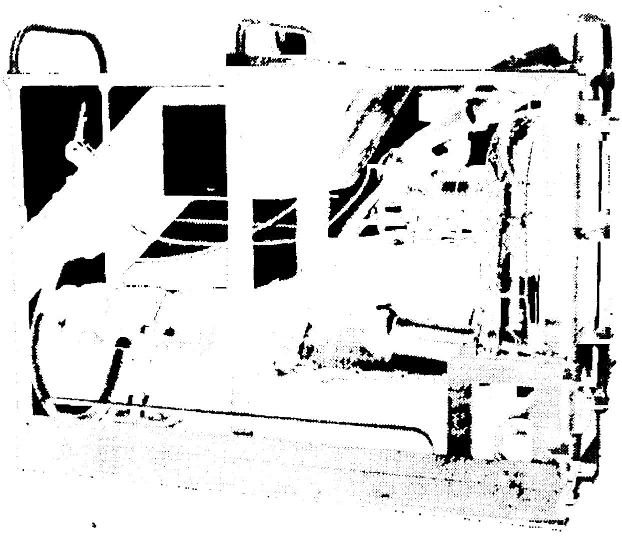
BANDSAW MACHINE

MID 7





LIGHTING SETS in stock



1½ K.V.A. Petrol Driven Alternators, 230 volts, single phase, 50 cycles, direct coupled to Ford Industrial 8 h.p. water cooled engine, complete unit mounted on steel base plate, with Guard and Canvas Cover. Complete with Control Panel.
Overall dimensions, 4ft. long, 3ft. 3in. high, 1ft. 6in. wide.
Approx. weight 6½ cwt. Unused and ready for running.

Price £100 each F.O.R., F.O.L.

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SIMPLY EFFECTIVE!

PLUG IN...

...and you have a leak-proof air-connection

We illustrate the non-swivel type of Coupler. A swivel type is available where required, to prevent kinks in hose.

To: **A. SCHRADER'S SON,**
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Please send illus. Catalogue of Schrader Industrial Air Control Equipment.

NAME

ADDRESS

MP7

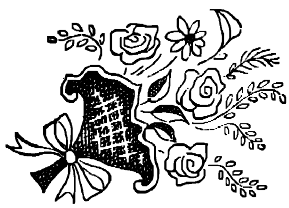
Yes, it's as simple as that! Just plug in to your air line and you have an instantaneous connection to pneumatic tool or machine. The Schrader quick-acting Coupler provides this effective connection. Air wastage is eliminated, so that pneumatic tools work at maximum efficiency and compressor output is maintained economically.

Schrader

Trade Mark

AIR CONTROL EQUIPMENT

This was a pressing affair



One of our customers was particularly anxious to show a new set at Radiolympia. He wanted a moulded cabinet and he wanted it in a hurry — only a few months to go before the show. We looked at the design and called in our mould making department. They tut-tutted. With this design, six to nine months for the mould, they said. We called in our designers. We all got down to it. Next we got hold of our customer. Look, we said, this design as it stands means a one piece mould and that means you miss the show. But if we change the design slightly like this and this we can break the job down into three parts. That cuts the time by three and we could make the show. Okay, he said, carry on. We did and we made the show. The job was good, the set was a winner. Everyone was happy.

If you want to know about plastics ask **Ashdowns**

In addition to making mouldings, we have a special department for fabricating "PERSPEX", and we make "ASHLAM" electrical insulation boards, which, incidentally, are exceedingly good.

ASHDOWNS LTD., ECCLESTON WORKS, ST. HELENS, PHONE: ST. HELENS 3206

Ashdowns is a subsidiary of Pilkington Brothers Ltd.

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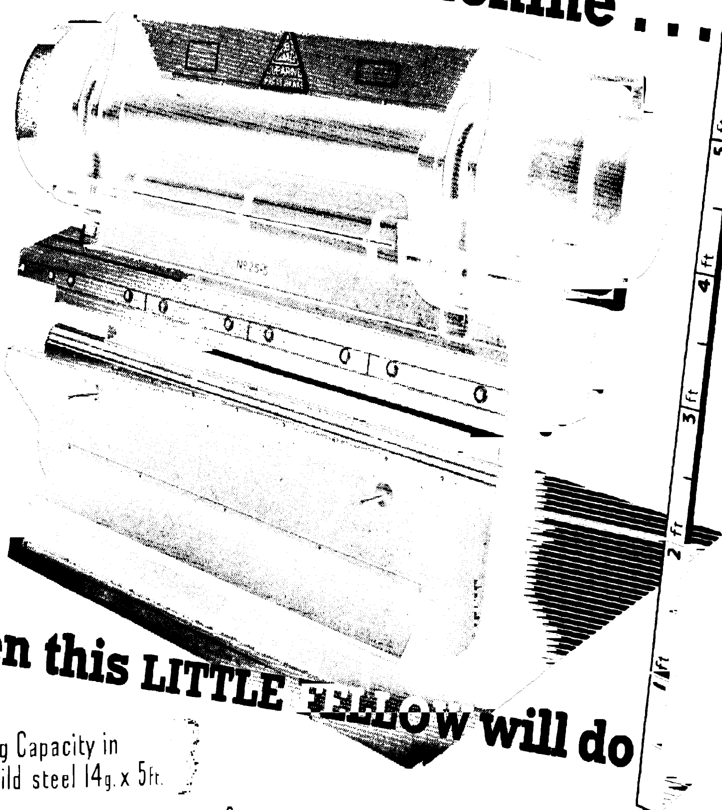

when this LITTLE FELLOW will do

Forming Capacity in mild steel 14g. x 5ft.

Bed and Ram 6ft. 6in. (overall)

Admits 5ft. 2in. between housings

MANUFACTURED BY VICKERS-ARMSTRONGS, LTD.

British Clearing 25 and 35-ton capacity Press Brakes will satisfy all your light Brake work requirements, and free your bigger equipment for heavy work. The 25-ton Machine illustrated here is fitted as standard with a 9" Horn Extension to the bed and ram, a useful feature for box work. Like all the large British Clearing Press Brakes, these little fellows have adjustment to the ram, are fitted with twin indicators reading to .001" and, of course, are equipped with similar types of sensitive clutches allowing for inching or repeating strokes of ram. They are of all steel construction.

Do not hesitate to write to us for fuller particulars and quotation. Deliveries of these little fellows are not too bad.

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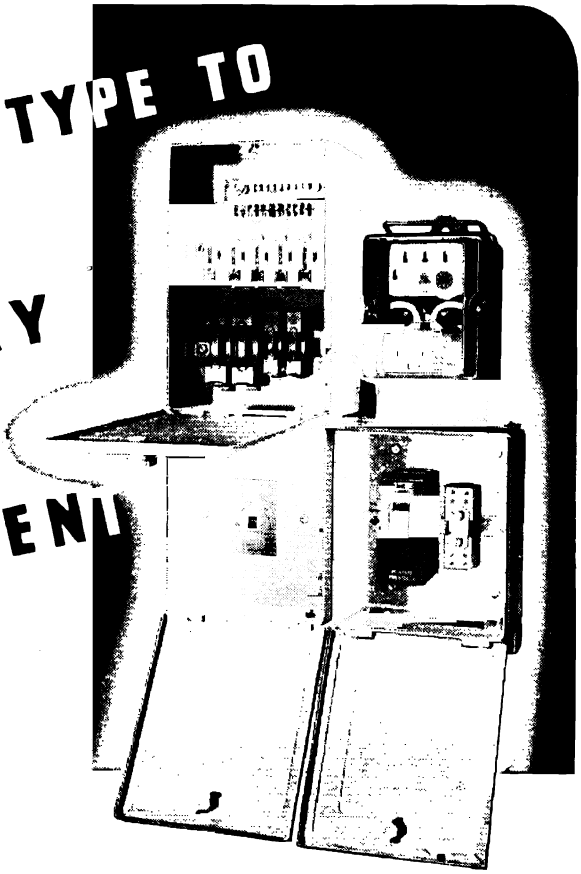
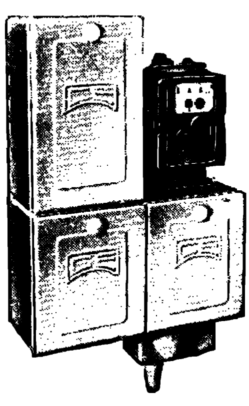
THERE'S A TYPE TO SUIT EVERY REQUIREMENT



THE CEMDU HOME SERVICE DISTRIBUTION UNIT



The range of CEMDU models amply covers the electrical intake and distribution needs of any building, large or small. Available in either 60 ampere or 60 and 30 ampere double-pole Main Switch Control, CEMDU is the trouble-free system rapidly being adopted by supply authorities. It obviates for ever those old untidy methods of loose wires and scattered components. CEMDU is easily installed, it is neat, compact and completely enclosed, any type of meter may be fitted and extensions are a simple matter.

Write for details to the sole manufacturers.

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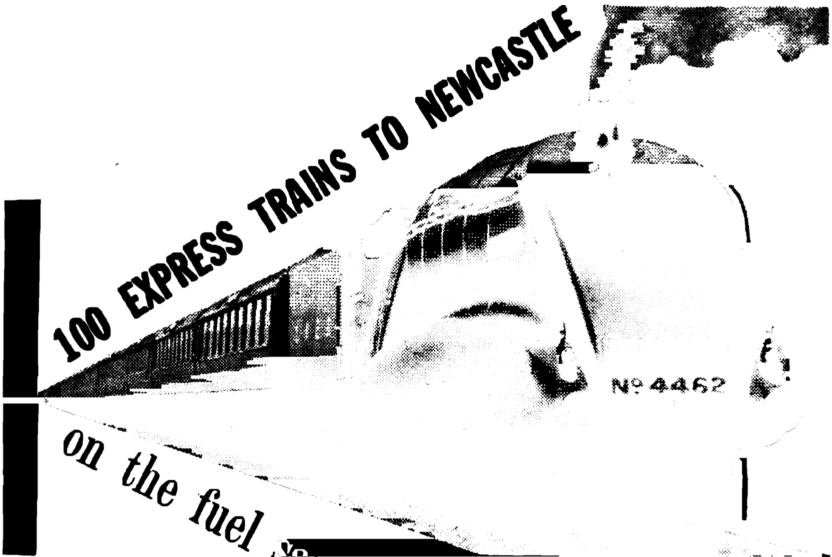
C9



on the fuel saved by insulating *one* factory

Nearly 600 tons of fuel—enough to run 100 express trains from London to Newcastle—can be saved in *one* steel-framed factory of average size by lining the roof and walls with Celotex cane-fibre insulation. For Celotex overcomes unnecessary heat losses; in buildings of every kind its installation produces immediate and drastic fuel economies; and in these economies—lower fuel bills and a reduced capital charge for the heating plant—the cost of Celotex is quickly recovered.

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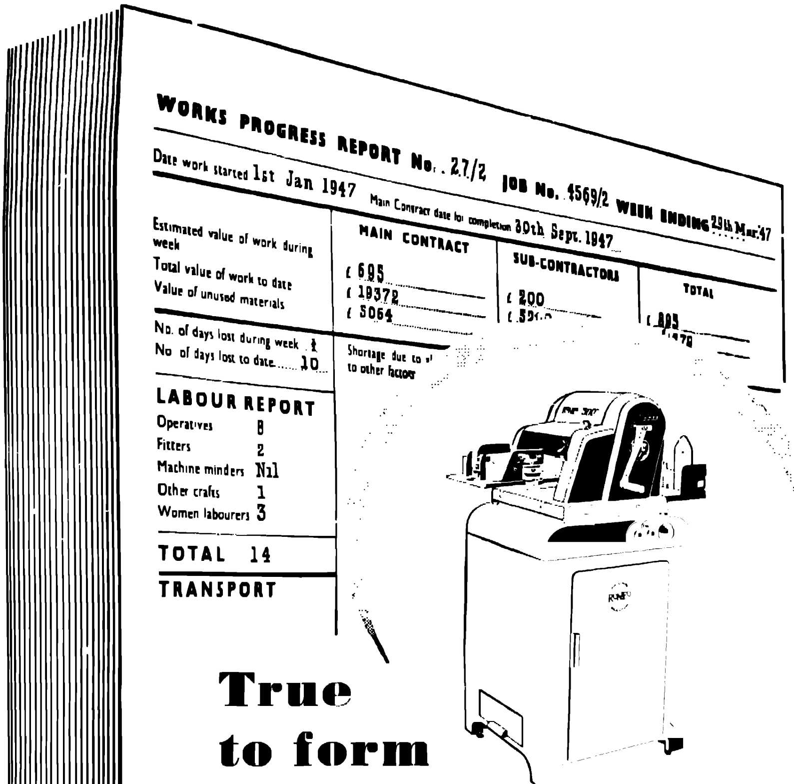

True to form

Most people who have to use them would agree that the next best thing to abolishing all forms would be to have them more readable and less confusing. With this aim, Roneo have introduced their "Pre-cut" method of reproducing office and factory forms. Briefly, the method is this: the typewritten matter, which is usually added in a separate operation is printed at the same time as the form itself. All "registration" difficulties are overcome since the typewritten details automatically appear against the correct heading or ruled line. If you are interested, Roneo will tell you more about it. It's a matter of form, and the next move is yours.

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T.B.W.

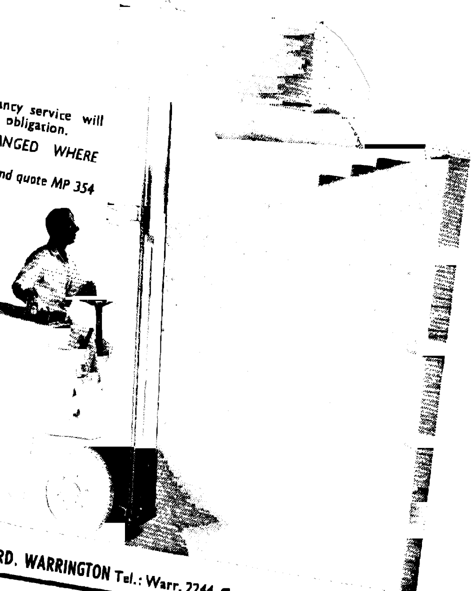
What does it cost?

In a factory or warehouse handling, transporting and stacking 2,000 tons of material a week, the introduction of one Conveyancer and the necessary 2,000 pallets would cost initially £4,800. The following comparative figures will withstand any investigation.

"Conveyancer" System	£.p.a.	Ordinary Method	£.p.a.
Depreciation and Maintenance of Trucks ...	250	Depreciation and Maintenance of Equipment (£1,000)	100
Depreciation and Maintenance of Pallets ...	375	Wages. (20 men) ...	5,000
Wages. (One Operator)	275	4% Interest on Capital (£1,000)	40
(One other man)	250		
4% Interest on Capital (£4.800)	192		
Total Expenditure p.a.	**£1,342**	**Total Expenditure p.a.**	**£5,140**

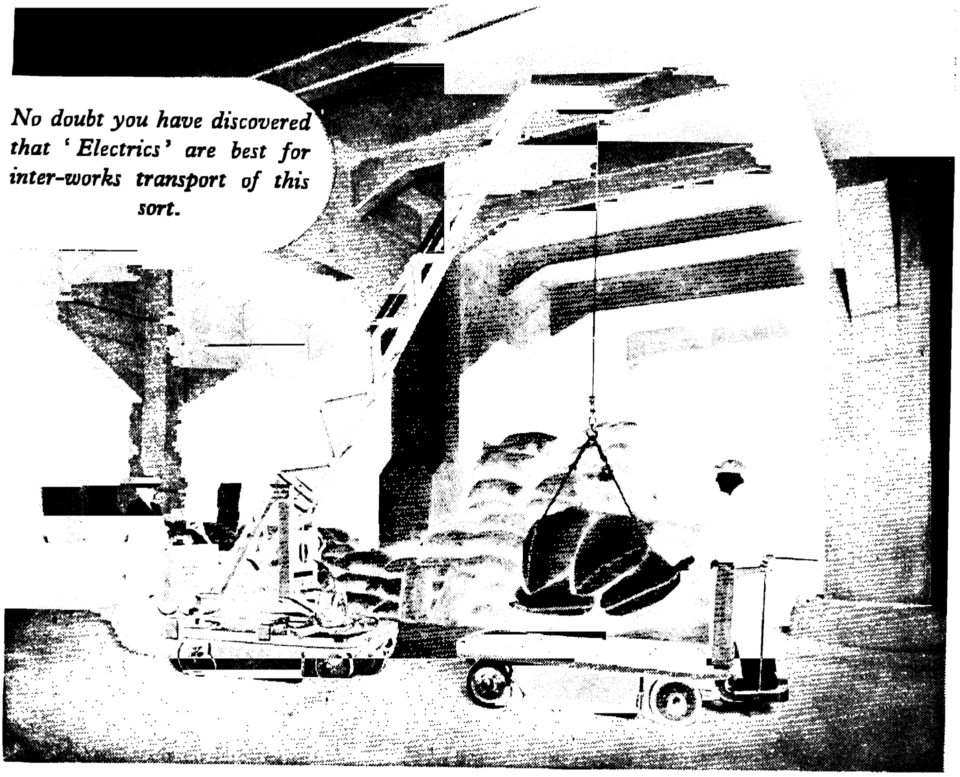
NET SAVING IN FIRST YEAR OF CONVEYANCER SYSTEM **£3,798**

Our material handling consultancy service will answer your problems without obligation.
HIRE PURCHASE TERMS ARRANGED WHERE REQUIRED.
Please write for Broadsheet 869 and quote MP 354 when enquiring.

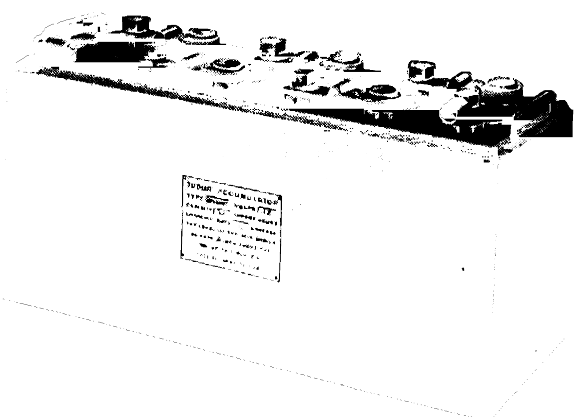


The "Conveyancer"

ELECTRO-HYDRAULICS LTD. LIVERPOOL RD. WARRINGTON Tel.: Warr. 2244. Grams.: Hydraulics, Warrington



but have you discovered that Tudor Accumulators are the most dependable power unit for any type of Electric?



TUDOR ACCUMULATORS

T55/47

THE TUDOR ACCUMULATOR CO. LTD., 50 GROSVENOR GARDENS, LONDON, S.W.1.

IN considering the application of horsepower to industrial uses, the student is at once faced with the fact that some jobs need a *lot* of horse and others only a *little*. The problem can be partially solved, of course, by keeping in the factory a stock of various sized horses, from those vast amiable brutes with fur round their feet to the teeny-weeny ones that pull Cinderella's coach. But what when the Works Manager requires only 1/4 or 1/6th Horse Power ? Is he a butcher to dissect the faithful beasts ? Modern industrial practice inclines to the view that for such purposes it is better to lay off raw horses entirely and use Desoutter power tools instead. We endorse this view.

call up the LITTLE horses

Specialists in Lightweight, Pneumatic and Electric Portable Tools. **DESOUTTER**

DESOUTTER BROS. LTD THE HYDE, HENDON, LONDON, N.W.9. PHONE: COLINDALE, 6346-7-8-9.

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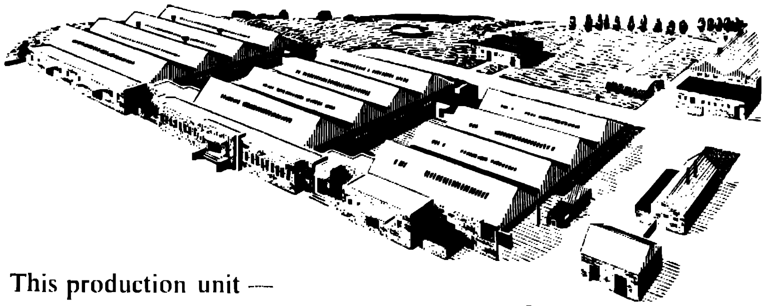

This production unit — the Halesowen works of Mansfield Maxton Ltd., is entirely devoted to the manufacture of Fractional horse-power electric motors of the highest quality.

Like nearly everybody else we are finding it almost impossible to keep up with the stream of orders for our product. But, we are always willing to discuss any problem to do with electric motors, and if you want $\frac{1}{2}$ h.p. 3-phase motors - you may be lucky.

MANSFIELD MAXTON LTD.

Halesowen, Birmingham - Telephone:- Halesowen 1691.

Mass Production

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PUTTING THEM TO WORK

DURING the last three or four weeks we have had a series of registrations under the new Registration for Employment Order. First we had the urban street traders, then " all persons, including employers and directors, working for bookmakers and betting establishments, night clubs, gaming and amusement saloons, and football pools." Now, as we go to press, it is the turn of " young men and women with no gainful pursuit." The avowed purpose of these registrations is, of course, to discover how many " spivs, drones, eels, butterflies, social limpets or other undesirables " there actually are.

There has been considerable agitation and excitement about these characters but it is not known whether their numbers constitute an army, a battalion or a mere company. Seven months ago some 1,208,000 youths and men of working age, other than schoolboys and students, or, of course, inmates of prisons or mental institutions, were recorded as " not earning or seeking to earn a living," but they were nearly as numerous, totalling 1,127,000, in 1943 when the Ministry of Labour was " scraping the barrel for man-power and exercised ample powers of compulsion. Now they must include many who are unemployable by reason of mental or physical health, war disability or other causes, which prevent them from appearing in official statistics. Most of them are certainly not industrial deserters.

Registration will serve to indicate the true extent of " spivery " and " dronery." It will correct exaggerated talk and will, at the same time, demonstrate how little the country can rely on industrial direction as an antidote for maldistribution of labour. The main reason for these registrations is the earlier Control of Engagement Order governing those who wished to change their jobs. The ordinary workers affected by this Order would resent a control which affected them but left others untouched, hence this latest spate of registrations.

Despite all this, the new registrations indicate a sudden and unexpected reversal of policy. All through the spring and early summer of last year the Government were winding up the remaining labour controls. They had, however, for so long failed to work out a long-term policy for the redistribution of labour between industries that they were finally driven back on the abandoned controls in search of quick results. The Orders reflect a lack of policy ; the direction which is being applied is temporarily tolerable, because it is relatively ineffective. It is not a policy ; it is an undoubted evil. The policy has still to be found.

When there are more jobs than would-be workers the latter naturally go for the easy, pleasant, satisfying, or profitable work. If full employment is to be permanent the problem of recruiting labour for unattractive trades will also be permanent. It follows therefore that the remedies must be equally permanent.

The time for thought which the Government have gained by re-introducing direction must be used to prepare a policy to make direction unnecessary in 1949. The Government's responsibility is to the nation, and we have much to lose by continuing to wait upon the opinions of a Government which cannot make up its mind.

"That 'Music While You Work' used to be a nice Slow Fox Trot. Now it's always The Post Horn Galop.

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Current co[illegible]ng industry

TRENDS

ALTHOUGH the year is yet yo[illegible]s of progress. Paper targets and practical efforts are intermingled in [illegible] trade gap which can be regarded with satisfaction tinged with hopefulness. Slowly but surely we are forging a pattern of better things. It may, perhaps, be opportunistic and short-term, as is necessary under the present fluid conditions, but there is concrete evidence of progress. The Nation has become crisis-conscious and the business world appreciative of the fact that our salvation depends on individual efforts and not on the automatic miracles of "planning" or the potential benefits of the oncoming Marshall plan.

The basic reason for hope is flanked by cheering symptoms of psychological recovery. Output and production are responding to the big schemes of expansion. Coal, the corner stone of the Nation's existence, is being brought to the surface in larger quantities and exported, while steel production is touching record levels. Better figures of overseas trade are being shown with a drop in imports and a concomitant narrowing of the balance of payments. The effects of bilateral trade agreements will be seen more clearly as the year rolls on as likewise any merit from the Anglo-Russian pact. Capital cuts in industry and the curtailment of expenditure have fitted into the pattern of events. Choruses of praise for the workers are sometimes accompanied by pontificial warnings regarding loopholes lest the capitalist becomes more wealthy but elder statesmen of industry eschew these paeans and remain cool and phlegmatic.

Control of Wages

THE menace of rising wages, with its influence on the cost of manufactures, jeopardising the placing of our exports in competitive markets abroad, has forced the Government to emphasise the need to reduce costs.

Rising prices and higher wages are an acute danger to our whole economy. Increments in wages last year ranged over numerous industries and resulted in nearly 5,000,000 work people receiving higher pay amounting to nearly £2,000,000 weekly. This surely represents the fulfilment of the principle that the labourer is worthy of his hire. It took place with a decline of over 17,500,000 man-hours worked during the year owing to shortening of the working week.

The element of danger in increasing costs which has spread like a prairie fire, threatens to make academic the Government's appeal for increased production. The result is that increases in the income of wage-earners, which nobody grudges, are illusory.

The T.U.C. has reported on wages, prices, profits and related subjects, and although fully aware of the danger of inflation, has not seen fit to counter inflation by relating wages to output. It has rejected the practicability of any general wage pegging and instead emphasises the imperative need to stabilise prices. Otherwise, it argues, it is useless to attempt to put a ban on wages claims to meet the cost of living which impinges in the working-class budget.

All are agreed that the impact of lower prices should not fall on wages alone; greater efficiency, including better machinery, new inventions, avoidance of waste and obedience to the principle of "small profits, quick returns" should play their part.

Forum for Industry

DEVELOPMENT Councils to stimulate industry continue to become associated with many trades. They do not supersede Trade Associations or Trade Unions; they provide a forum where representatives and independent experts can consider industry's main problems. They are not given compulsory powers over industry and their functions are limited and defined. The raising of funds by charging a levy is within their power as also the obligation requiring members of an industry to maintain a register of persons employed.

Their efforts are designed to be directed to stimulating work on the part of the workpeople, giving a lead where necessary and, to some extent, providing financial help to common activities, such as research. They have to maintain contact with the Government departments concerned with their trade efforts, but they are independent industrial bodies, not branches of the Government. For this reason they have not compulsory powers over industry. Development Councils are supplemented in some industries by the establishment of Production Committees for the purpose of helping increased output and corresponding reduction in costs.

Employers have not altogether been enthusiastic about working parties, and it is quite understandable that they may be less enthusiastic over Development Councils. But the President of the Board of Trade avers that they are not intended as emissaries of outside interference with the conduct and management of industry, but as auxiliaries. Trade Unions are advocates of Development Councils and Working Parties, as they aver they tingle with new blood and new ideas.

News and views of men who lead

QUOTING the

Competition is the key to success

MR. E. B. BURTON, Chairman of J. Brockhouse & Co., Ltd. :—

Our biggest enemy to-day is that insidious doctrine that teaches that no man shall have more than another ; it means in fact that no one shall have more than the poorest. I have a deep-rooted conviction that healthy competition is the key to general success and prosperity.

There are, of course, both written and moral rules which must be observed in any form of competition, but, speaking from my own personal experience, I am forced to the conclusion that there is a higher standard of moral conduct and a more rigid code of self-discipline between competitive industrial houses and industrial managements than there is between various Government departments and the Government departments *vis-a-vis* the public.

At the present time this spirit of competition is repressed and discouraged for the sake of planning on a national scale ; the two concepts are not diametrically opposed and the one must not be sacrificed for the other.

So far we have not learned to plan on a national scale and all such attempts have only succeeded in reducing the general level of activity in order to bring conformity with the plan. Such planning must, however, be approached with great diffidence, and until we are sure of the result of any scheme, we must be careful not to destroy that which we have already built up in the past.

The compromise between private competition and a national plan will eventually be found, but the process is, and will be, painful, and, without wishing to appear too pessimistic or to enter into politics I am afraid that I am forced to admit that, in my view, the plans at present before the nation are doomed to failure, but with the courage and spirit of the people which I have already remarked upon, I am convinced that this failure will not thwart us from eventual success.

High rates of depreciation

SIR ALAN GORDON-SMITH, K.B.E., D.L., Chairman of S. Smith & Sons (England) Ltd. :—

Another reason for retaining a large proportion of profits is one which I think may not yet be adequately appreciated in the commercial world, and it is this.

We write off depreciation at a fairly high rate, but it is based on what plant cost when originally purchased ; but the cost of plant has shown serious inflation and if we are to replace it at anything like present values we shall have to find more than is provided by writing off the cost of older plant.

It is, therefore, essential that substantially more than our present depreciation—high though that is in relation to cost—should be retained so that we shall not be hampered by financial considerations when replacement of plant is required, for it is only by the operation of up-to-date plant that industry can hope to compete in the world market.

Need for free choice of cotton

LIEUTENANT-COLONEL THOMAS M. BROOKS, Chairman of Horrockses, Crewdson & Co., Ltd. :—

It is patent that the basis of quality in any product must be the raw material used in its manufacture; all the efforts and experience of management and operatives are of little or no, avail if the foundation is wrong. It was the free choice of the cotton we purchased, coupled with the inherent skill of our workers, which over the years built up the goodwill your company enjoys in many markets.

It is surely in the interest not only of ourselves but of the nation that the choice of cotton must remain with the buyer, and not be left in the hands of those who have no knowledge whatever of the purpose and ultimate destination of the goods for which it is required.

We therefore feel that we must again, as last year, stress the overwhelming importance of our being afforded the same facilities as were offered to us prior to the war through the services and experience of the Liverpool cotton market. If the Raw Cotton Commission cannot secure this result, and quickly, grave consequences for the cotton industry must be apprehended.

The fact is, that we find it impossible in some instances to obtain the cotton we require, and we do not believe it is generally realized that inferior cotton will not only lead to a serious loss of production but will adversely affect the earnings of our workers and render abortive the general adoption of new schemes of re-deployment which in the experimental stages carried out under the direction of the Cotton Board have so far proved highly successful.

Chairman

The profit motive

MR. JULIAN S. CROSSLEY, Chairman of Barclays Bank (Dominion, Colonial and Overseas) :—

You have heard recently of the proposed new Government corporation which is to be formed under the title of "The Colonial Development Corporation" with resources of £110,000,000.

It is reasurring to learn that the Government corporation is to be operated on a commercial basis and, accordingly, that considerations of profit will not be overlooked. This question of profitability is not a trivial matter to be lightly dismissed, because if the great work of colonial development is to be carried through it is likely, eventually, to need capital resources on a scale far in excess of that available from a Government corporation.

The motive of profit or gain has ever been one of the mainsprings of human activity, and if conditions are not such as to offer a fair prospective return it may be difficult to attract new capital into this field.

While high profits may attract envious and sometimes critical comment, the ventures which end in total failure are often quickly forgotten except by those whose money is irretrievably lost.

Investors are, however, obliged to accept this risk of loss, frequently a very real one in newly developing countries, and they can hardly be expected to do so unless they also have the prospect of earning a good return on such undertakings as are soundly based and proved successful.

A multiplicity of development corporations, whether Government sponsored or otherwise, can never be an effective substitute for the self-reliant individual who is prepared to risk his money and devote his skill in pioneering enterprise.

The brewer's dilemma

MR. A. E. WILEY, Chairman and Joint Managing Director of Ansells Brewery Limited :—

It would, of course, be impossible for any brewer to satisfy, in every respect, the public's demands for a cheaper beer, a stronger beer, and a larger quantity, because the Government controls all these factors.

It is true that within the regulations there is a limited degree of latitude for the brewer, but he is compelled to use 15 per cent. less material than he did in 1946, and not to exceed the average strength he is allowed.

If, therefore, he elects to strengthen a portion of his beer, the duty, and consequently the price, goes up and the quantity produced comes down ; on the other hand, if he produces a cheap beer, and thereby increases the quantity to try and meet the shortage, criticisms arise as to quality.

To face this dilemma, Midland Brewers have agreed upon a compromised plan which enables them to brew a reasonable proportion of higher gravity beer with a minimum quantity of weaker beer sold at a reduced price, to bring them within the regulations.

Since Mr. Strachey compelled dilution of beer and we introduced this scheme it has to a certain extent mitigated the shortage, but the trouble cannot be cured because too many people are chasing too little beer, especially in this district.

As the result of the autumn Budget further hardship will have to be borne by the long-suffering beer-drinker, who, like the patient camel, can sustain heavy burdens for long periods with little to drink but is reputed to be vulnerable about the last straw.

When introducing the extra beer duty the Chancellor referred to the weakness of beer in what appeared to be a rather fatuous manner considering the Government themselves instigated the weakening, but evidently he considers beer to be still strong enough to bear its share in raising a further £35,000,000, the amount of his estimate.

Retrospective taxation is wrong in principle

MR. G. M. KINDERSLEY, O.B.E., J.P., Chairman of Walker & Homfrays Ltd. :

After our accounts had been closed a Supplementary Budget was introduced increasing the rate of profits tax from 12½ per cent. to 25 per cent.

This increase was made retrospective to January 1 of this year. In our case, the increase causes no embarassment, as we have a very ample margin of profits, and a large amount of cash, but to make taxation retrospective is not, in my judgment, fair to directors of companies, who naturally frame their policy with regard to dividends and appropriations on the basis of the taxation as it is at the date they close their accounts.

I also notice that the Chancellor views with disfavour the increase of dividends, but faced as we are by a Government whose policy is nationalization of all the means of production, distribution, and exchange—if they remain in office long enough to do it—directors are, I think, justified in pursuing a liberal dividend policy, consistent with sound finance, before their shareholders are deprived, possibly on unfair terms, of their businesses.

HOW TO EXPORT

Written by S. HOWARD WITHEY, F.Comm.A., F.C.I., M.I.Ec.E., etc.

FOREIGN countries are beginning to publish long lists of goods and articles they are prepared to import, and many British producers are about to enter the export trade for the first time. The term " shipping trade " still creates a feeling of some bewilderment in the minds of manufacturers whose organisation has been based on satisfying the home demands, but as Britain has now no choice but to export to the limit of her capacity it is necessary that each producer should be conversant with the procedure and routine work to be carried out when goods of any kind are forwarded for shipment overseas.

In some industries, production is already very substantially above the pre-war level. The output of pig-iron, steel ingots, castings, machinery and tractors, for instance, is relatively high, and merchant shipping is something like twice the pre-war tonnage, but some industries are still lagging behind at a time when the maintenance of full employment and adequate living standards depends on raising the value of our exports to the level of our imports.

Materials for public works, wire and scrap iron, yarns and cloth, and capital goods of many kinds, are urgently wanted by overseas buyers, and all over the world there is a great demand for repairs. The opening of the engineering industry in South America India and China affords the opportunity for a higher production of machine tools, machinery and loose plant, and British producers now have a golden chance of capturing a large volume of the trade of the German machine tool industry all over the world, while the coming into operation of a shorter working-week will necessitate the use of more machinery and equipment of a higher productive nature.

As the sellers' market falls away, British manufacturers will be faced with the necessity of improving their methods of production and of modernising their equipment. Instead of accepting too readily the generous charity of our great fraternity overseas, Britain must stand on her own feet by paying for every import with an equivalent value in exports. It may be true that from the day the Americans abandoned price control an overseas payments crisis became inevitable, but the power to avoid further austerity lies in our own hands. The raising of export output will reduce the payments gap to manageable proportions, and there is little doubt that the countries whose dollar problems have been aggravated by the suspension of sterling convertibility will be compelled to restrict their purchases from America in favour of increased purchases in Britain.

Whether exports go direct or through agents, the basic procedure will be the same. Orders will have to be obtained ; goods will have to be suitably made up and packed ; packages must be marked and numbered distinctively ; freight charges will have to be ascertained and checked, prices quoted, marine insurance and other contracts entered into, and the various shipping documents properly made out and delivered to the proper quarters. Many colonial buyers have branches in this country through which business can be transacted, and a very considerable part of the export trade will be conducted through merchants who will receive cables and indents from overseas, containing lists of goods and articles required.

Some merchants will have authority to obtain goods from manufacturers and suppliers offering the most advantageous terms. Other merchants and agents will be instructed by the overseas buyers to obtain specified goods or articles from the manufacturers and firms named in the indents, and the indents may also contain details as to packing, marking, shipping insurances, ports of destination, and methods of payment. Moreover, some

orders may stipulate that no responsibility will be accepted in respect of any goods or articles sent that are not in strict conformity with the details specified, and while some manufacturers may prefer to use loose printed sheets as a part of a slip system, there is always the danger that some sheets may be filed before all the instructions have been properly carried out, or before all charges have been debited in the ledger.

Loose forms of one kind or another are a practical necessity in any export office, but as applied to overseas orders they carry definite disadvantages. By keeping duplicate books consisting of thin tissue leaves the instructions can be suitably written out, each original form being passed on to the person or department concerned and a carbon copy preserved intact. When all matters are taken into consideration, however, the most satisfactory method of booking export orders consists of recording all connected details in a separate book, and a typical pattern of ruling for this book is indicated below :—

If the required goods or articles are in stock, steps can be taken to have them shipped without delay, but if not in stock or in process of manufacture a definite production routine would have to be laid down, particularly if the requirements were outside the exporters' normal production. Certain technical data might have to be issued to the drawing office, and special drawings issued to the materials department. Or stores may have to be re-ordered, or details supplied to the costing department or clerk responsible for determining the prime cost.

Particular care should be exercised to ensure that all making-up and packing instructions are properly carried out. For certain markets, attractive packaging should be regarded as essential, and exporters would be well advised to become more colour conscious. In the South American republics, for instance, buyers are greatly influenced by the appearance of outside wrappers, and for Indian and far eastern markets goods like textiles should be wrapped in coloured wrap-

Indent

No :.........................

To :... .... 19 .....

Please purchase and despatch to us by an early vessel of the .... Line the goods described below. You will insure them for the amount of your Invoice, adding ....per cent. for profit, and for your reimbursement please draw on us in favour of the..............................Bank, with which we have arranged that your Draft on us, with documents attached, shall be accepted as cash, the discount and premium being placed to our account—

Marks, etc.	*Packing*	*Description of Goods*	*Remarks*

Orders Received [Export]

Date	*No.*	*Name etc.*	*Description of goods*	*Marks, etc.*	*Pack-ing*	*Insur-ance*	*Profit %*	*Date For-warded*	*Amount Debited*	*Remarks*

pers, with elaborately designed tickets and labels. Each separate piece should be wrapped in fancy linen, and whereas most textiles may be packed in bales, many goods will have to be packed in boxes or cases.

The outer covering of bales may take the form of glazed brown paper next to the fancy linen wrapper. Then a canvas sheet and a further layer of some waterproof material—such as tarpaulin or oiled cloth—should be followed by another sheet of canvas, and while lags of wood at the four corners may be sufficient to prevent damage en route, it is often advisable to place boards on the top and bottom of each bale. The sizes to which bales are to be pressed down by hydraulic pressure will depend on the precise nature of the goods, and when it is necessary to pack in cases lined with tin, the lids should be soldered on to make the cases waterproof.

Wood casing is the usual method of packing machinery, and parts should be boxed separately and fastened inside the main case. Small holes in spares can be plugged with grease, and the threads of screws should be protected with grease or other similar composition having a high melting point. Hardware, china and glassware will be packed in barrels or kegs lined with straw, any necessary instructions or warnings being boldly stencilled on the outside. Machine projection should be avoided, and as a skid for running a machine on rollers a strong double keel of battens should carry the floor of the case. By constructing inspection traps in the walls of the main case, uncasing and re-casing at customs boundaries can be avoided, and twisted wire as a binding is less likely to jump than hoop iron. Joints can be locked by driving nails at opposing angles. Packages consigned to large towns need not be limited to a specific size, but if they are to be transported up-country by natives they should be small and neatly packed.

When goods are ready for export, the shipping company should be requested to furnish particulars of the next vessel available for the particular destination, also the loading port, dock, and the date by which the goods should be alongside. Freights, method of shipment, and insurances can then be arranged, and the goods forwarded to the dock with a shipping note instructing the dock superintendent to ship the goods on board the vessel named. A draft form of shipping notes is reproduced at the foot of this page.

Freight may be charged either on weight or measurement, at the option of the shipping company. In the case of light and bulky goods, the ton will probably consist of 40 cubic feet, whereas machinery and heavy goods would usually be charged by the ton weight. Wool may be charged at so much per lb., bricks and tiles at so much a thousand, glass at so much a cwt., and instruments according to their number, and a percentage for primage may be added to the total freight. Goods are usually measured on the quay, and the dimensions extended by tables to form the basis for the calculation of the charge, which may cover many services such as from port to port ; from port of shipment to a town in the interior ; or from places in the U.K. to places abroad. The freight note will also give particulars of the dock dues, the cost of the bill of lading, and commission charged for services rendered.

When the vessel is ready to depart, the character of the cargo will be notified to the customs and the ship's master will attend before the proper officer and answer any questions that may be raised relating to the voyage. He will also present a list of all dutiable articles on board, and in order to secure " most-favoured nation " treatment and the benefit of lower rates of customs duties, certificates of origin will probably have to be filled in on the back of the invoices, or as separate documents. Each exporter should ascertain the countries for which certificates of origin and consular invoices are required, as frequent changes are likely to take place in these requirements. The latest information can usually be obtained from the London Consulates of the various countries.

Goods forwarded by firms in inland towns are usually sent to an agent in the port from where the vessel is sailing, the agent attending

Shipping Note

....19......

TO the

Superintendent of the...Dock

Please receive and ship the following per ....

for .... :—

Marks *Nos.* *Quantity and Description of Goods*

Charges to our Deposit Account *[Signed]*......................................

to all customs formalities and obtaining the bills of lading. Consequently, advice notes sent to agents should give all details likely to be needed in filling up the requisite customs forms, including the name of the vessel by which the goods are to be shipped, the dock or port of destination, the weight and measurements of the packages, and the value of the goods. The shipping bill will constitute the clearance, and this document should be signed by the exporter or agent, and countersigned by the customs officer.

The person whose name appears in the bill of lading is the legal exporter of the goods, and the bill of lading is the principal shipping document, without which the consignee cannot take delivery.

Bills of lading are usually drawn up in sets of three, each bearing an impressed stamp, and an unstamped copy for retention by the shipping company. These copies are referred to as " parts," and as a rule two are forwarded to the consignee by different vessels. To ensure that one part arrives before the goods, it should be sent by air-mail, and the first copy to be presented on the arrival of the ship would render the other parts void.

The form and wording of bills of lading differ according to trade and route, the usual style consisting of tabulated columns for showing the port of destination; marks; numbers; contents; gross weight, etc., with a declaration to the effect that the goods have been shipped " in apparent good order," and giving the names of the shipper and consignee, followed by printed paragraphs constituting the conditions of the contract under which the goods are carried. Merchants are cautioned against shipping goods of a dangerous or damaging nature, as by so doing they become responsible for all consequential damage, and also render themselves liable to penalties imposed by Statute.

Shipowners are not responsible for correct delivery unless each package is distinctly, correctly and permanently marked before shipment, and are at liberty to carry the goods by any route, and to tranship or land and store and reship and forward the goods at the exporter's risk, and if chemicals, liquids or other goods of a dangerous or damaging nature are shipped without being previously declared and arranged for, they may be discharged or thrown overboard, and the loss would fall on the owners of the goods. In those cases where a certificate of origin is required, the declaration would probably have to be made in the following form :—

" I (or We)..
hereby certify that I am/We are the supplier/manufacturer(s) of the goods/articles specified on this Invoice, and that the making and the signing of this Certificate by me/us on behalf of the said supplier/manufacturer(s) has been duly authorised. I (or We) have the means of knowing and I, (or We) do hereby certify that this Invoice from the said
to

....

amounting to ....
is true and correct, and that all the goods/articles included in the said Invoice are bona fide the manufacture of the United Kingdom, and that a substantial portion of the labour of that country has entered into the production of every manufactured article or part included in the said Invoice to the extent of not less than
of the value of each such article or part in its present condition, ready for export to

....

Dated this *day of* ....
19 .

When quoting prices, the term " Loco " denotes the cost at the place of production, but if the price includes packing and placing on board the exporting vessel the term " F.O.B." should be used. The price quoted may also include the shipping and freight charges to the port of destination, referred to as " C.I.F.," and if marine insurance is included the charge will be for " C.I.F." or " siff." Sometimes an invoice may be dated ahead of the date on which the goods are exported, the time of payment being then counted from the forward date, thus giving the buyer an extra period of credit.

From the moment of shipment, the goods will pass from the exporter's ownership to that of the consignee, consequently the insurance policy should be taken out in the latter's name, the actual work being done by the shipper who will act as the consignee's agent in this matter. Fire, breakage, pilfering, extremes of temperature, and deterioration from various causes are some of the risks which have to be run, but there is no object in over-insuring because any compensation would have to be based on the loss actually sustained.

On the other hand, if there is any doubt as to whether all risks have been adequately covered, a second policy may be taken out, and under legitimate conditions excess premiums can be recovered. Damaged goods remain the property of the consignee who is

expected to dispose of them as best he can and then base his claim on the net loss. The insurer is not entitled to throw damaged goods on the underwriter's hands and claim for the market value of similar undamaged goods. The principle to follow is to effect insurance on the delivered value, i.e. the invoiced price plus interest, freight and other charges to destination.

Woollen, cotton, and silk and rayon goods doubtless will occupy a high place in the acceleration of our exports, other high-ranking products being machinery, vehicles, electrical apparatus, pottery, and rubber and leather goods. Silk and similar fine goods are best packed in zinc-lined cases, but cottons and calicoes should be press packed in bales. The design of packing for hollow-ware should be for close-nesting without jamming or damage, and, of course, articles of furniture will be suitably knocked down.

All packages for export must bear distinctive marks, with accurate measurements and sometimes their weight, and should show the initials of the consignees or the makers enclosed in some geometrical device, with the name of the port of destination in letters not less than two inches in size, the consecutive number being added below the mark. If a design is cut out, a stencil of tin sheet can be laid on the package and the mark painted with a quick drying ink, the letters being made of composition and used in much the same way as an ordinary rubber stamp with a large pad. All small parcels should be separately marked to indicate the nature and number of the contents, as this will be of considerable convenience to the consignee when unpacking at the other end.

It should never be forgotten that when goods are sold by description it is an implied condition that they shall answer to the description. Until this condition has been fulfilled the seller has no right of action against the buyer for non-performance of a contract which, in addition to the price, method of delivery and manner of payment, should specify the quality of the goods.

The keystone of the export drive is likely to be the acceptance of the principle of bilateral trading for Britain, backed by a series of payments agreements unrelated to the price of gold or the exchange rate for dollars. To work out new monetary agreements in a short space of time is not easy, but pacts will have to be arranged, and that recently arranged with Belgium is likely to form a pattern for a series.

In 1944, the amount of sterling which the National Bank of Belgium was prepared to hold was fixed, and the Bank of England agreed to hold a similar amount of Belgian francs. The amount has since been increased, and to cover debts due by the Belgian Government to the U.K. a further amount of sterling will be held, if necessary, by the Belgian bank. The Central Bank of Argentina recently announced that duly authorised exports of textile goods in general are to be granted exchange at the preferential buying rate.

The Government of Chungking now recognises the free market in her currency, and apart from a short list of licensed essentials which still command the old official rate, all foreign exchange transactions are to be carried out through a new Exchange Equalisation Board which, presumably, will fix daily buying and selling rates. For the Belgian Congo, the rate of exchange is parity with the Belgian franc, and for Algeria, Morocco, Tunisia, French Antilles, and French Guiana, the currency is at par value with the French franc. The following are at parity with sterling ;—West African pound ; South Rhodesian pound ; Palestinian pound ; Cyprus pound ; Gibraltar pound ; Maltese pound ; Bahamas pound ; Bermuda pound ; Jamaican pound, and Falkland Islands pound.

In the French Franc Area, payment may be made in sterling bills drawn under credit opened with a bank in the U.K. providing for reimbursement from a French account, or in the currencies of the French Franc Area. In Spanish Territories of the Peninsula, the Canary Isles, Ceuta and Melilla, the Spanish Zone of Morocco, and the Spanish Colonies, payment in sterling, or sterling bills, from the Anglo-Spanish clearing, is the manner of payment officially laid down.

Special methods have also been prescribed for Spain, as well as for the South American republics of Argentina, Bolivia, Brazil, Chile Paraguay, Peru and Uruguay, and, of course, in the U.S.A. and all territories under the sovereignty of the U.S.A. payment is made in dollars, or in sterling, or sterling bills, from American accounts. Appropriate methods of payment for goods exported to other territories are indicated below :—

Territory.	*Manner of Payment.*
Belgian Congo	In sterling, or sterling bills, from a Belgian account, or in Belgian, Luxembourg or Congolese francs.
Belgium	In sterling, or sterling bills, from a Belgian account, or in francs.

Canada	In sterling, or sterling bills, from a Canadian or Newfoundland account, or in Canadian or Newfoundland dollars.
China	In sterling, or sterling bills, from a Chinese account.
Colombia	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Costa Rica	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Cuba	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Czechoslovakia	In sterling, or sterling bills, from a Czechoslovak account, or in Czechoslovak crowns.
Denmark	In sterling, or sterling bills, from a Danish account, or in Danish kroner.
Dominican Republic	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Dutch Guiana	In sterling, or sterling bills, from a Dutch account, or in Netherlands or Netherlands West Indies guilders.
Ecuador	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Finland	In sterling, or sterling bills, from a Finnish account.
Greece	In sterling, or sterling bills, from a Greek account.
Greenland	In sterling, or sterling bills, from a Danish account, or in Danish kroner.
Guatemala	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Haiti	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Honduras	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Italy	In sterling, or sterling bills, from an Italian account.
Liechstenstein	In sterling, or sterling bills, from a Swiss account, or in Swiss francs.
Luxembourg	In sterling, or sterling bills, from a Belgian account, or in Belgian or Luxembourg francs.
Manchuria	In sterling, or sterling bills, from a Chinese account.
Mexico	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Netherlands	In sterling, or sterling bills, from a Dutch account, or in Netherlands or Netherlands West Indies guilders.
Newfoundland	In sterling, or sterling bills, from a Canadian or Newfoundland account, or in Canadian or Newfoundland dollars.
Nicaragua	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Norway	In sterling, or sterling bills, from a Norwegian account, or in Norwegian kroner.
Panama	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Philippine Islands	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Portugal and Portuguese Empire	In sterling, or sterling bills, from a Portuguese account.
Ruanda Urundi (Mandated)	In sterling, or sterling bills, from a Belgian account, or in Belgian, Luxembourg or Congolese francs.
Salvador	In sterling, or sterling bills, from an American account, or in U.S. dollars.
San Marino Republic	In sterling, or sterling bills, from an Italian account.
Sardinia	In sterling, or sterling bills, from an Italian account.
Sicily	In sterling, or sterling bills, from an Italian account.
Sweden	In sterling, or sterling bills, from a Swedish account, or in Swedish kroner.
Switzerland	In sterling, or sterling bills, from a Swiss account, or in Swiss francs.
Turkey	In sterling, or sterling bills, from a Turkish account.
Vatican City	In sterling, or sterling bills, from an Italian account.
Venezuela	In sterling, or sterling bills, from an American account, or in U.S. dollars.
Yugoslavia	In sterling, or sterling bills, from a Yugoslav account.

Note: Payments in foreign currency signify drafts, telegraphic transfers or otherwise to a bank in the U.K. or its agent abroad for account of such bank.

continued on page 66

JOTTINGS

DESIGN WEEKS WILL BE HELD IN Cardiff from April 12 to 17, in Manchester from June 21 to 26 and in Birmingham from October 11 to 16. It is hoped to hold Design Weeks in Bradford and other cities in 1949. Programmes will include conferences between manufacturers, retailers and industrial designers, a series of open forums for architectural associations and for massed meetings of women's and youth organisations.

A PLANT AND MACHINERY register has been put on the market by Percy Jones (Twinlock) Ltd. It is claimed to be suitable for both the small and the large user in recording all essential details. It provides for a full record of rates and allowances made by the Inland Revenue year by year for balance sheet purposes.

DEVELOPMENT OF NEW LINES IN heat insulation by Fibreglass Ltd. are in hand. They include super-fine fibres for aircraft insulation, battery separator plates and impregnated tissue for protecting fuel oil pipelines. A large extension of the company's textile division is another move. Demands for electrical insulation products, such as yarn, paper and cloths, have already outrun production capacity. Direct export is being opened up in many world markets of components in electrical machinery.

A NEW RANGE OF TRUCKS, medium-capacity, diesel-engined, known as the Comet, have been designed by Leyland Motors Ltd., and are now in production. They are essentially export models with the purpose of meeting strong competition in world markets. Designs are also completed for a Leyland Comet export passenger chassis of which production will begin in the next few months. The goods range consists of freight, dump and tractor models, 75 h.p., with power transmitted through a five-speed gearbox and a hypoid bevel rear axle.

OWING TO THE SHORTAGE OF silver, postal orders have had to be used by Leyland Motors Ltd., instead of small change for paying employees wages for several weeks.

HOW TO EXPORT

(Page 42 this Issue)

The Editor will be pleased to send free reprints of this article to any reader on request.

CHEAP BABIES' PRAMS BY MASS production for the home market were suggested in the Commons by Mr. Richard Law, South Kensington M.P. Mr. Belcher, Parliamentary Secretary, Board of Trade, replied that the supply of prams was not unsatisfactory and prices generally well below the maximum permissible. To exchange to a standard and cheaper model for the home trade would increase the export price of existing models.

SIMPLIFIED PLANNING OF kitchens is shown in an unusual model exhibited on the British Electrical Development Association stand at the Restaurant and Catering Exhibition at Olympia. A complete set of kitchen components are all strongly magnetised; they can be readily attached to each other, or detached. The model can thus be used to arrange in a few moments any type of kitchen, complete with doors, windows, service hatches and electrical appliances.

REMINGTON RAND BEGAN WORK on equipping a new factory at Hillingdon, Glasgow, with the arrival of the first half of a complete plant for the manufacture of typewriters and electric razors from Bridgeport, Connecticut. They have been allotted part of the former Rolls Royce factory at Hillingdon. Production may begin in April or May.

A CONVEYOR BELT NEARLY A quarter of a mile long and weighing over 9 tons has gone to the Delco mines in Sierra Leone from Dunlop's Manchester works.

AID TO SOLVING A MINOR problem of welding—the protection from spatter of the coloured filter glass in the operator's helmet or handscreen—is made by Murex Welding Processes, Ltd., Waltham Cross, in introducing "Perspex Covers." The cover is kept clean by polishing periodically with a soft cloth and is unbreakable, thus forming a mechanical protector for the filter glass. Present production is centred on the standard 4¼ in. x 3¼ in. size, but other sizes will be produced soon.

NEW FACTORY IN CARDIFF OF Hopkinson Electric Company was inaugurated at a reception and dinner given in Cardiff by the Chairman, Mr. L. D. Bennett, and directors of the company. Mr. Marquand, Paymaster General and M.P. for Cardiff East, said, in proposing "The new industries of Wales," that Hopkinsons were to be commended on transferring from London an industry of the greatest importance. Mr. Bennett disclosed that the company's resettlement scheme will give employment to over 2,000.

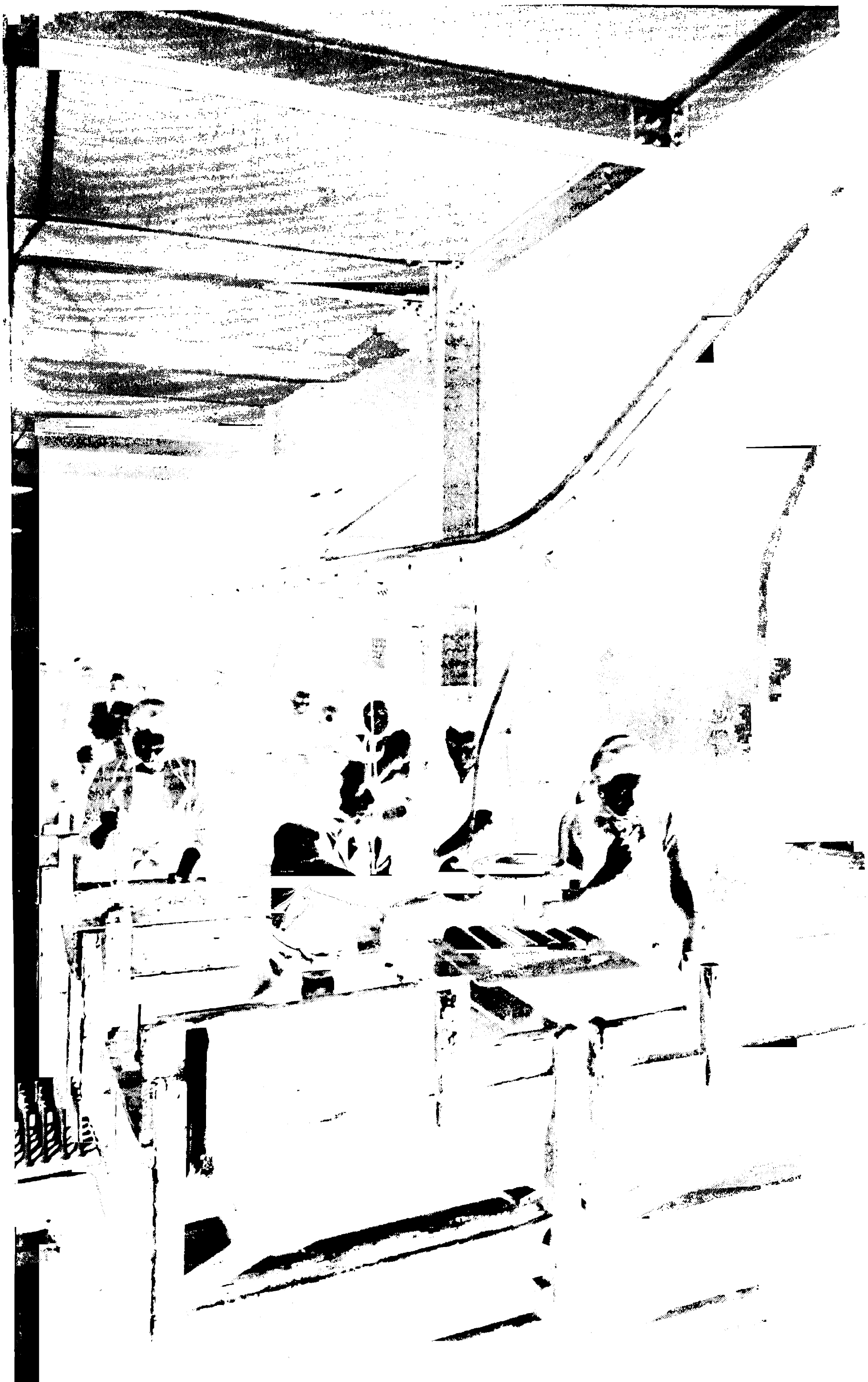
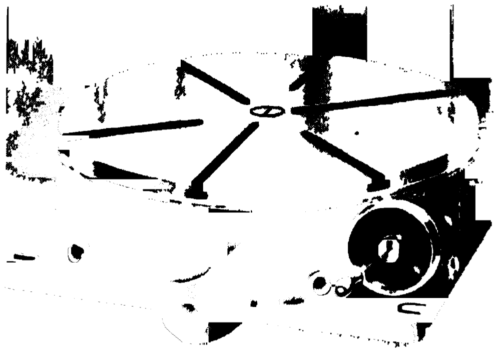


PHOTO *of the* MONTH

The Matrix inclinable table shown by Coventry Gauge & Tool Co Ltd



A companion exhibit by the same company the optical circular table

An unusually compelling exhibit was this enormous Dormer drill

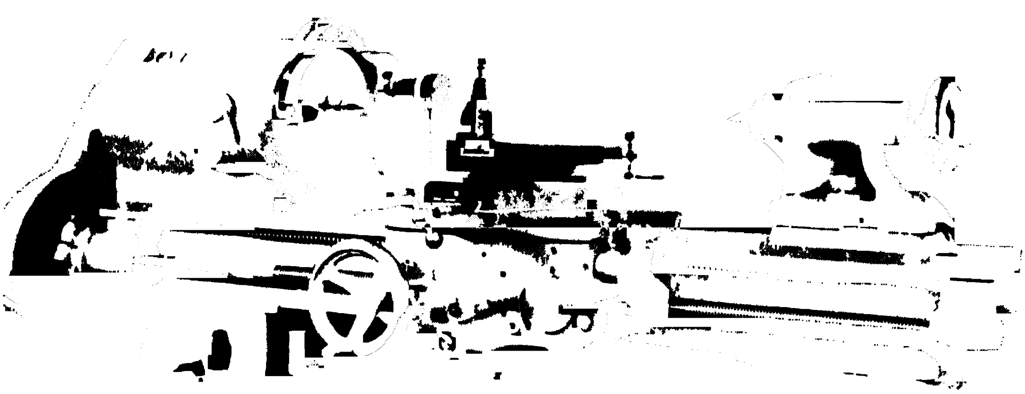
GAUGE & TOOL

In January 1946 the Gauge and Tool Makers' Association, a trade organisation of British firms manufacturing precision tool and gauges, measuring instruments, press tools, moulds and dies, jigs and fixtures, and diamond tools, held an Exhibition of its Members' products at the New Hall Vincent Square, London, S W 1

That Exhibition was unique in being not only the first in Great Britain to deal exclusively with precision tools and gauges, but also the first Exhibition of any size to be held in London after the termination of hostilities in 1945

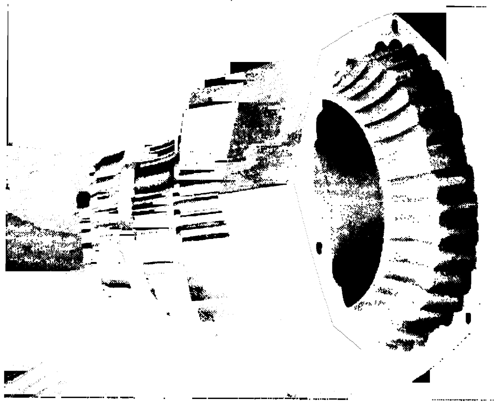
Readers may remember the extensive report on that Exhibition in our February 1946 issue, under the title "A Production Engineer visits the Exhibition"

In view of the unqualified success of that initial venture, the Gauge and Tool Makers' Association decided to arrange a similar



The smart lathe shown above is the Boxford 4½ in screwcutting lathe by Denford Engineering Co Ltd

A selection of diamond tools from J. K. Smit & Sons Ltd.



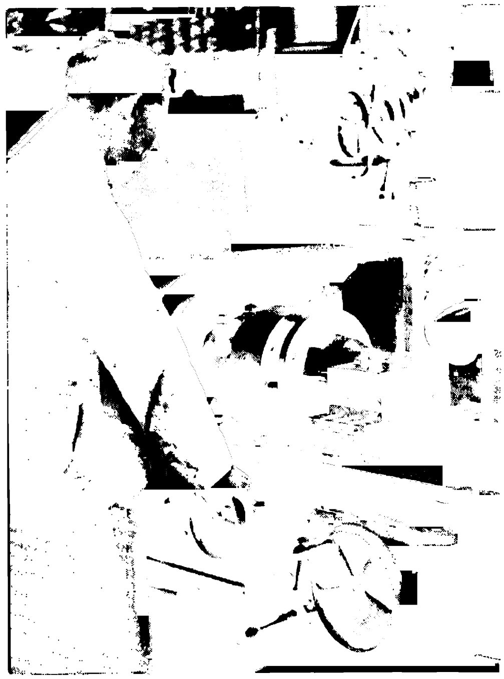
A mould like this is a difficult job—see below.

EXHIBITON

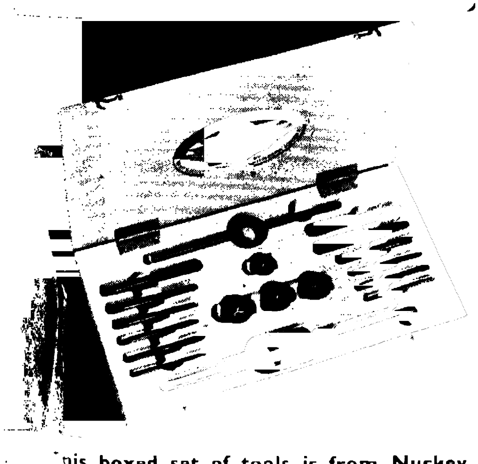
function early in 1948 and to invite the National Federation of Engineers' Tool Manufacturers to participate in a joint Exhibition.

The Gauge and Tool Exhibition 1948 opened at the New Hall, Vincent Square, London, on Monday 26th January, and closes on Friday, 6th February; and details of the products displayed by the 82 Exhibitors were given in our special Exhibition Supplement last month. The photographs on these pages are a selection of the more unusual exhibits which lack of space compelled us to omit from our last issue.

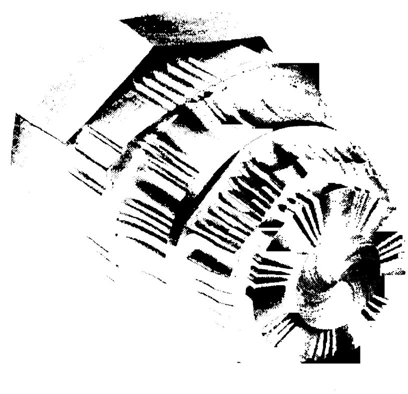
The scope of the products covered by the Exhibition included: Gauge and measuring instruments and equipment; jigs and fixtures; press tools; special purpose machines and equipment; moulds and dies; pneumatic and electric portable tools; diamond tools; and a wide range of engineers' cutting tools.



This is the B.I.P. Tools device that does the job—see below.



This boxed set of tools is from Nuckey Scott's Stand.



Another view of the finished job—note the detailing.

DEVELOPMENT OF

WELDING can be defined as a process whereby two pieces of metal are brought together, heated to a molten state and fused into once piece. Welding science played a great part in our war effort and its utility, carried over to post-war days, has met with further expansion, while the limit of its uses is not yet in sight.

At one time its application was limited ; only identical metals could be welded—steel to steel, aluminium to aluminium, etc., but research perfected methods which enabled cast or malleable iron to be welded to steel. The physical factor which hindered progress was the difference in ratio of expansion between one metal and another under the influence of heat. In welding ferrous and non-ferrous metals together this difference is much more emphasised : at one time it was not thought possible to overcome it and the engineering fraternity was sceptical as to its eventual commercial success. Work now, with these metals, is undertaken as a matter of ordinary routine and one-time unpromising combinations are a complete success.

Such unlikely union as steel and aluminium, regarded as impossible, can now be achieved perfectly and guarantees given. Tests to destruction have shown that the weaker parent metal will fail before the material in the union area, which thus proves the efficacy of the weld.

The ramifications of scientific welding are very great ; its beneficial touch is felt in almost every industry where mechanical equipment is used. Channels of its employment are too wide to set them out in extenso, for they range from all-welded locomotives to simple pipe flanges and embrace engine frames and bedplates, steel valves, steel structures, oil tank welds, worn rails and vees of railway crossings, etc.

The success which has attended the use of electric arc-welding in the field of general engineering has caused ship-builders to give its application special consideration. Welded construction can produce economies in cost and owing to the rigidity of any part of a welded structure, fabrication of a ship's hull in sections is possible to a much greater extent than with riveted design.

On British railways welding has perhaps made slower progress than might have been expected. Probably this is due to the fact that engineers have been perfectly satisfied with the tensile strength of weld steel but they have not been impressed with its ductility as compared with that of good quality ordinary mild steel. The Canadian Pacific Railway, it may be mentioned parenthetically, has carried out experiments with arc-welded rail heads, while the application of oxy-acetylene welding to the bonding of rails on electric railway stands has been successfully undertaken in South Africa. In America, all-welded locomotives are doing excellent service.

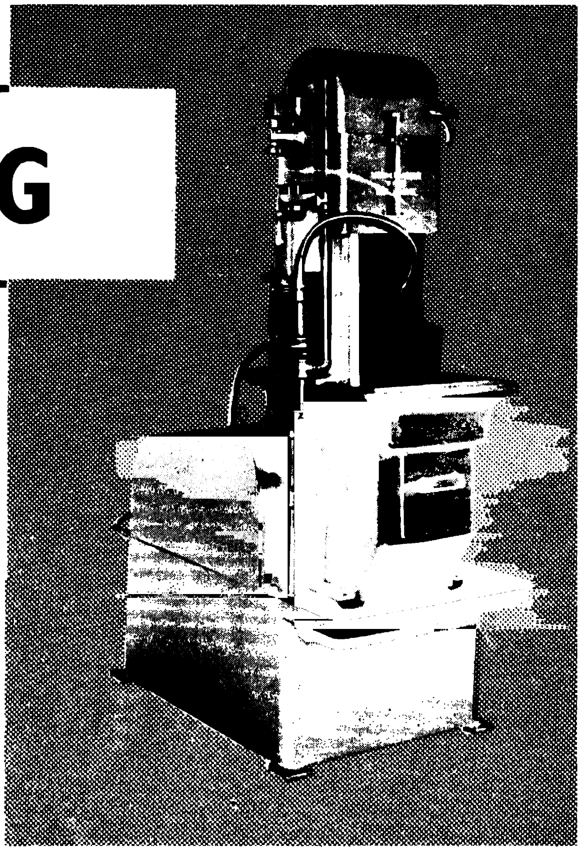
Although welding was designed to meet special types of repair work, it is employed in many directions in new construction. Certain industries have been quick to seize the opportunity offered and further extensions on a wide scale continue to take place.

Machine bases offer splendid starting points for a programme of conversion to arc welded steel construction. A good example is found in the changeover of a portion of a Belt Grinder manufactured by the Porter-Cable Machine Co., Syracuse, N.Y. The part changed over is the lower portion which serves as both base and coolant reservoir. The upper portion is also being redesigned but has not been put into production because of present inadequate manufacturing facilities.

The former design is shown in Fig. 1. Note that this is on integral cast frame on which is mounted the driving motor by means of a separate bracket. This shows the reservoirs which are necessary to contain the water or special coolant used for wet grinding. The left-hand tank is a coolant reservoir while the one in the foreground is a settling tank.

The welded design is shown in Fig. 2 and 3. Here, the base incorporates the motor mount and reservoir as a single unit. This

WELDING



In this article by Mr. R. Mordaunt, illustrated by examples from the Lincoln Electric Company's special welding applications Dept., the advantages of welding and the development of welding methods are emphasised. On the right is the machine which is referred to in the text. All photographs and diagrams are re-produced by courtesy of the Lincoln Electric Co., Ltd.

design illustrates the flexibility and economy made possible by welded design in that the two functions (base and container) can be combined and material can be so placed as to provide greater rigidity with less weight and at lower cost. The coolant reservoir and settling tank are easily incorporated as a part of the base, simply by the addition of a single baffle plate. Thus, separate containers were not needed to be placed around the base, frequently causing trouble by overflowing. With the reservoir integral with the base, any overflow was contained inside the unit. In other words, the new base has eliminated the leaks formerly giving trouble when the coolant ran out onto the shop floor.

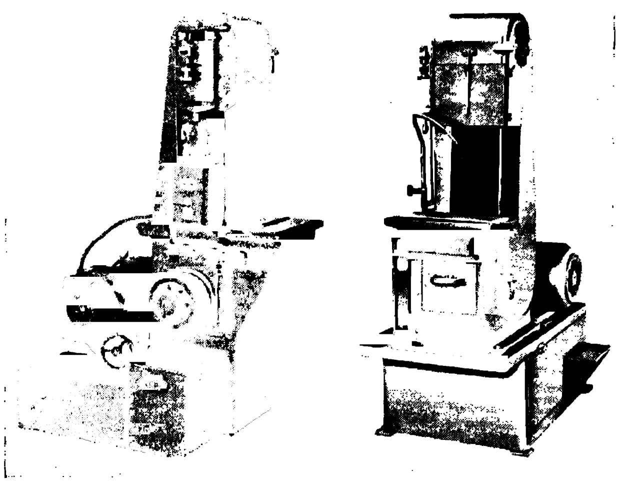
The component parts of the re-designed base are shown in Fig. 4, Plates A, B, C, D, and E, plus the formed piece O forms the sides with openings as shown. They are butt welded from the outside. The main part of the base is formed by bending, the plate is sheared, notched and the hold P is flame cut before bending. The other openings are formed by the insert pieces. First, the lower floor L and baffle K is welded completely, the top plate end being tack welded at the same time. The members A, B, C, D and E are tacked in place before strip N is welded in to complete the pan.

This method of construction is necessary because of limited facilities of the plant which was able to take the contract for building the base. Time did not allow other methods and in fact, equipment could not be obtained to do the work in a more economical way.

In spite of the handicap mentioned, this base has been found more satisfactory due to the non-leaking feature, elimination of the bracket for the motor and improved appearance. The weight of the new base is approximately one-half that of the equivalent section and parts which is replaced. Thus, it can be appreciated that a considerable saving has been made.

Another good example of the use of arc welded steel to gain important engineering, manufacturing and sales advantages is exemplified in a recent change-over by the Snow Manufacturing Company of Chicago, a division of the R. G. Haskins Company.

This company are manufacturers of the Haskins Precision Tapping Machine as shown in Figs. 6 and 7 and they recently adopted an



The cast iron base design is on the left of this illustration. Note the loose tanks and pans. The machine on the right is mounted on the re-designed, all-welded base described in the text. Dripping and leaking oil has been eliminated by this re-design.

all welded frame for this machine.

The upright frame, when completed, no matter how it is built, must be extremely rigid, and must maintain alignment within .001 of an inch for its entire length. In addition, the frame must provide the space required for the installation of the various small units of control equipment which go to make up the tapping or drilling machine.

On the former cast iron design, a wall thickness of $\frac{3}{8}$ in. was used. This is replaced in the new design by a simple formed channel of $\frac{3}{16}$ in. hot rolled steel. Somewhat lighter material could have been used, but in order to use the same size frame for several models, material sufficiently heavy to handle the largest capacity unit was used. Holes were drilled in the face of the formed channel, and cold rolled steel strips, welded to the channel by plug welds, act as the ways for the supporting table. These ways were plug welded in a sequence which started at the middle and proceeded outward in both directions. This sequence prevented distortion and held the ways absolutely flat and uniformly tight after fabrication.

Next, the cross members and shelves for the control equipment are welded in place in a fixture which properly locates and holds them rigidly in place during the welding operation. After fabrication, the frame is given a japan finish resulting in a streamlined, clean-cut appearance. A number of very important engineering sales and manufacturing advantages are inherent in this change-over:

First, the finished unit is lighter. The former cast iron frame weighed 177 lbs., while the new welded frame weighs only 104 lbs. . . . . a saving of 73 lbs. or 41%.

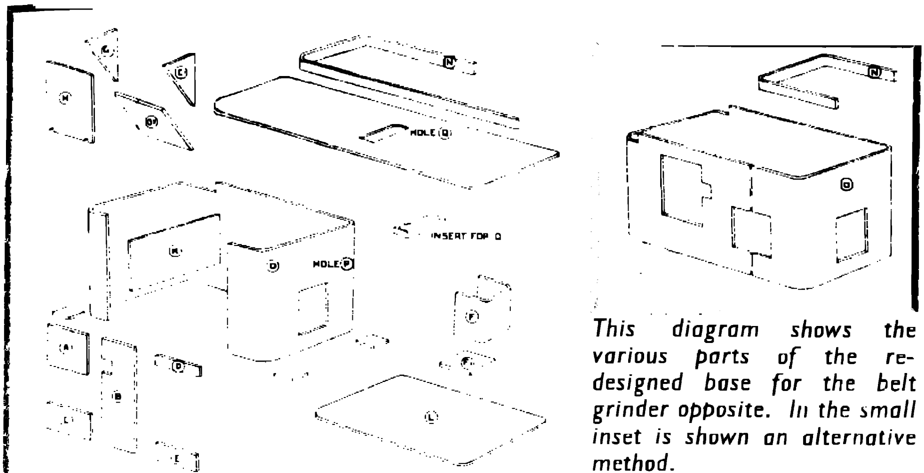
Second, the new welded frame has sufficient rigidity that five models (2 tapping units and 3 drill presses), each of which formerly required separate and individual cast frames, now can be placed in the welded frame. This standardization of frame sizes will be a distinct asset in the flow of production and ability to make quick deliveries in the highly competitive post-war market.

Third, standarization of frames has an important customer advantage in that the holding jigs and fixtures for all five units are now interchangeable.

Fourth, the greatest sales and service advantage gained by this re-design is the fact that all control units are easily accessible by merely swinging open a hinged door on the back of the machine. In the former cast iron construction, the motors and controls mounted in the upright frame were accessible only with great difficulty because only small openings were available to get at this equipment, due to the cross ribbing necessary for rigidity in the cast construction.

With rigid welded construction, the frame is open and all adjustments and maintenance are simple and economical. It would have been impossible to obtain this open type construction using cast iron without increasing the wall thicknesses and size of the frame very substantially over what it was originally.

Fifth, important manufacturing economies were obtained in the change-over. Holes in



This diagram shows the various parts of the redesigned base for the belt grinder opposite. In the small inset is shown an alternative method.

the frame are now punched instead of drilled, resulting in further saving. Moreover, 80% of all milling operations have been eliminated. Actually, over 50% of the machine man-hours have been eliminated by using welded steel. There also is a saving in preparation of parts for the finishing operation, although the cost of the finishing operation itself is practically the same.

Sixth, it has been possible to incorporate the foot control as a part of the welded frame, rather than as a separate foot treadle, shown in Fig. 6. The base of the tapping and drilling machine is still made of cast iron, but a redesign of this part is under way at the present time which will further enhance both the value and appearance of the finished unit.

The art of welding, as applied to the strict requirements of the manufacturing chemist, has been helped by advances in the improvements in stainless steels. The introduction of this steel for the manufacture of apparatus used in almost all trades, ranging from domestic utilities to fine chemicals, has made it necessary for the Welder to develop a suitable technique in order that this material is not spoilt in the early stages and also that its properties of resistance to corrosion shall not be impaired by faulty workmanship.

Among the many uses of electric arc-welding developed in the United States, that used in the fabrication of reinforced concrete pipe is an outstanding development contributing to the permanence of many public improvements.

There are several kinds of arc welding; the metallic arc, the carbon arc. the atomic hydrogen and the shielded arc methods. Their application is one of the newer developments in the construction of pipe lines for water, gas and oil.

Particular attention has been directed in the application of welding to the avoidance of surface blemish which was such an obvious feature in the early days of this new metallurgical science; pit marks were very evident due to the affinity of the oxygen in the atmosphere for the molten metal. This stimulated research and the problem was solved by enveloping the point of fusion in hydrogen. Results obtained in this way overcome the unsightly and furthermore afford a great purity and strength of the weld metal. Crankshafts of motor cars and commercial vehicles, reunited after fracture in this manner, have proved this, while further testimony has been obtained in larger components belonging to stationary power units, marine engines and other plant. It has been found that there is not the slightest risk of further failure.

The use of welding for repair and maintenance work is now undertaken in engineering and allied trades in all directions. Not only so, but the cost is a fraction of the capital outlay of a new component; it has been computed at about 10 per cent. Furthermore, it is a method that can be resorted to in order to avoid delay in waiting for replacement. This is obvious in connection with machinery which is damaged; broken or fractured parts can be set up and kept in perfect alignment during the process of welding, while if the

work is expeditiously undertaken it saves a big loss from the production angle.

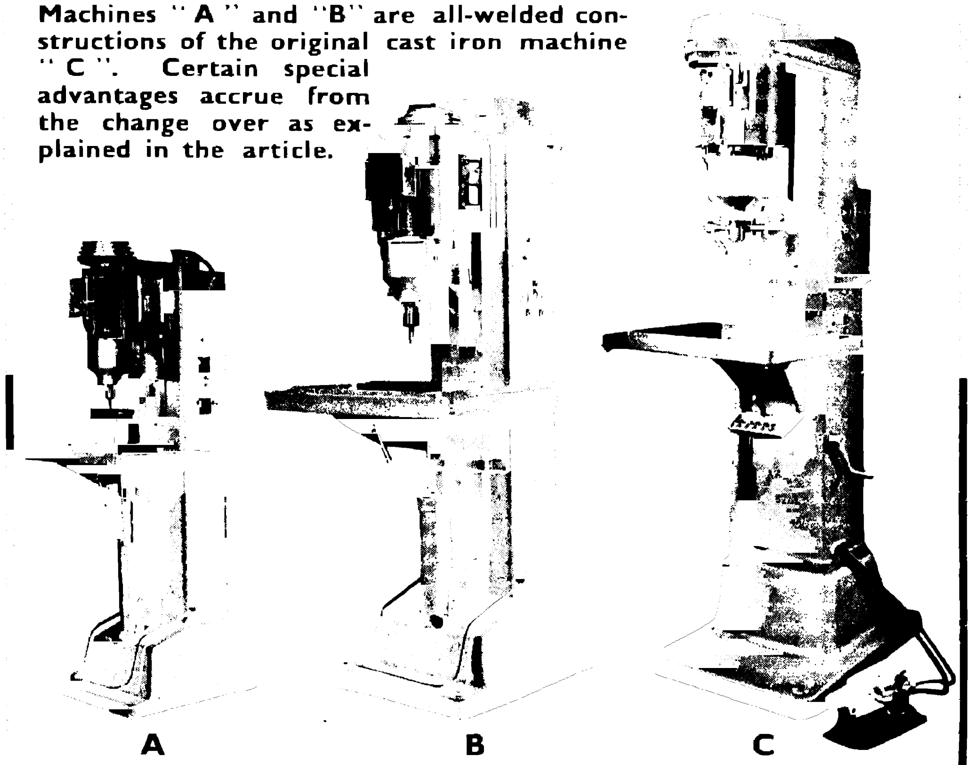
As applied to repair work and maintenance, welding calls for a high degree of skill and experience on the part of the operator. Progress made in connection with the repairing of plant and machinery has constituted a practical contribution of inestimable value, while the absolute dependability of the result has brought much credit to welding engineers.

Welding methods which apply to the maintenance of factory plant are too numerous to recite. Machines required to cope with heavier loads than those for which they were originally intended, can be strengthened, while those of foreign origin, for which replacements are not procurable can be made to function with the aid of welding methods. Repairs can be carried out on blast furnace stove casings, building up of rolls, crane rails, castings, etc., and the usual reconditioning work done in steel and iron foundaries. Components wrongly machined can be made to fit with the aid of welding. Indeed its application is almost endless in repair, maintenance, or correction of faulty work.

Castings which have reached the final stages of machining can be altered without loss of strength, so likewise can heavy castings belonging to key units be repaired. Equally agreeable results are obtained when boilers develop faults; welding allows the original thickness of a weakened plate to be restored without restoring to a maybe troublesome and unsightly riveted patch.

Welding methods are employed in many directions in the case of normal wear and tear, where defective or worn areas offer themselves for reconditioning or remoulding. Specially chosen grades of material are welded on and then undergo machining to fashion them to the required tolerance. It has been established beyond dispute that the wearing qualities of machine parts which have undergone this operation, do not lose in tensile strength or physical properties, nor are wearing qualities weakened in any way. On the contrary, it has been found that they are often better able to resist wear; indeed in certain cases it has been demonstrated that their lasting qualities are superior to those of a new component.

Machines "A" and "B" are all-welded constructions of the original cast iron machine "C". Certain special advantages accrue from the change over as explained in the article.



By Our Market Correspondent.

The Commodity Markets

Rise in Basic Materials and Foodstuffs

INCREASES in the price of coal, tin and certain edible commodities, which have taken place this last month or so, are indicated in the curve synthesis and have set in motion forwarning of an upward trend in industrial necessities. Apart from the consequences of our ill-balanced economy, specific factors are responsible for these increases but they are in no way associated with the remorseless inflation of American prices. The President of the U.S. is making genuine efforts to thwart any further upward trend but his powers are checked by the limitations Congress imposes upon him coupled with the powerful hand of the speculator.

Commodities are interwoven with the Marshall Plan, which is inflationary because it will increase Europe's buying power, and it will reinforce and, maybe, accelerate America's stockpile scheme.

The Government's bulk buying policy has been attacked by the union of Manufacturers who aver that business is being lost to overseas manufacturers whose costs of raw materials are lower than those available to British manufacturers. Copper, tin, linseed oil and casein have been quoted as examples.

Record Price for Coal and Tin.

The implications of the higher price for COAL and TIN are teasing industry. Pithead prices of black diamonds went up 2s. 6d. per ton on New Year's Day, bringing the total average increase since 1939 to 26s. per ton. The arithmetical achievement of the output target last year has had a psychological stimulus, and with the mild weather, only a modest seasonal rise in consumption is reported which has helped in building up a solid and gratifying gain in stocks.

An important feature in connection with TIN, the price of which was raised £73 to £510 in the middle of December last, is that the Ministry of Supply took courage in both hands and announced the new value without awaiting the outcome of U.S. negotiations with Bolivia. We have, once again, become the arbiter of the world's tin price and America has followed our ruling. The present figure is a record for the metal; it compares with pre-war quotations of between £156 and £230 a ton in 1938 and 1939.

Following the rise in price, that of tinplates for home delivery, basic IC 14 by 20 f.o.t. makers' works, was increased from 36s. 3½d. to 36s. 11d. and for export, basis f.o.b. South Wales from 39s. 6d.—47s. 6d. to 40s.—47s. 6d.

British manufacturers have maintained, for some time, that the Ministry of Supply's home issue price for COPPER—£132 a ton delivered—is unduly high compared with the world level. With Copper there is considerable variation in quality and specification.

Virgin copper stocks in Britain in 1947 were on the average between 2½ and 3 months' supply and stocks were built up towards the end of the year to around 100,000 tons. Consumption of virgin copper last year averaged around 29,000 tons a month; imports around 31,000 tons.

During 1947 New York export price of electrolytic copper varied between £109 and £132 f.a.s. The Ministry of Supply's average imported c.i.f. value for electrolytic copper last year was around £118. A lower price to consumers seems amply justified.

There is little to report in either the supply or consumption of LEAD, soft foreign pig (duty paid), which remains at its fixed price of £90 per ton.

Cargoes of ZINC are to come from Spain. The first consignment was reported last month of 4,000 tons from Carthagena to Swansea docks; the entire shipment being railed to the National Smelting Company's works at Glamorganshire.

Steel Price, Census and Output.

The Ministry of Supply has forewarned an increase in the price of STEEL in consequence of the rise in coal, but he does not think it will have any significant effect on the final price of most finished engineering products. Despite the cuts in the capital investment programme, supplies for the first half of the current year are likely to be insufficient to meet the full home and export requirements. This was probably the reason for the re-introduction of the census last month. Production records and optimum targets continue to be registered but the need for scrap is emphasised. Scrap iron and pig iron (chiefly acid silicon) are for practical purposes, interchangeable raw materials for iron castings.

Next to steel comes ALUMINIUM, so far as consumption is concerned. Before the war, four metals were consumed by British industry in greater volume than aluminium. but it has now taken a leading position. The British Aluminium Company is the sole producer of virgin aluminium in this country with large resources of bauxite, the raw material. Price remains at £80 p. ton.

World price for WOLFRAM ore was reduced last month following the December cut and now ranges 130s. to 135s. per unit c.i.f.

Demand for platinum has increased and price risen to £17 10s. per oz. The economic advantage of using platinum metals for critical parts of equipment is well recognised by producers of rayon, glass and electrical instruments.

On account of printing exigencies, Commodity prices and indices mentioned above were struck on a certain day during the month; alteration in price movements since then must be allowed for.

MODERN

INTERESTING ENTERPRISES No. 18

We have long felt that the manufacture of a basic food product such as margarine would be an interesting addition to this series. It was, therefore, with a sense of pleasurable anticipation that, having had an introductory chat with the management, we donned the traditional white coats which are provided for visitors to food factories and set off to study the various processes at the Purfleet Stork Margarine works of Van den Berghs and Jurgens Ltd.

Thanks to the whole hearted co-operation of the management we were able to have, as guides, members of the senior technical staff of each department and were thus able to draw on an unusually wide fund of technical information. For example, during our preliminary conversation in the offices we learned quite a lot about the origin and early history of margarine.

Although not so widely distributed in this country prior to the 1914-1918 war, it was not, as many people imagine, invented during that war. According to our informant its birth dates back some 35 years earlier still, to just before the Franco-German war of 1870-71.

1869 there was a food shortage in Paris and the rising cost of food, especially dairy produce, became a serious problem. Napoleon III gravely concerned at the plight of his people, offered a prize for the invention of an article of food " as nutritious, as stable, as palatable as butter."

The scientist Mege-Mouries noticed that when cows were starved they still yielded milk, although rapidly losing weight. He found that it was possible to obtain butter fat from this milk, and concluded that this must come from the body fat of the animal. If this were so, he reasoned, it must be possible to obtain butter from the cow's own fat.

Research indicated that butter substitute based on this reasoning could be made, and Mege-Mouries evolved a process arising from this discovery. The process won him a prize and before long he was supplying the whole of Paris with his butter-substitute, although it should be noted that it bore as little resemblance to the margarine of to-day as did his process to modern methods of manufacture.

Unfortunately the first World War which by compulsion of events made margarine an article of general consumption, did it a disservice from which it was slow to recover. The manufacturer of that period was faced with the task of augmenting supplies as a matter of urgent national necessity with only diminishing and inferior supplies of imported animal fats.

At the outbreak of the second world war large stocks of raw materials had been con-

ARGARINE MAKING

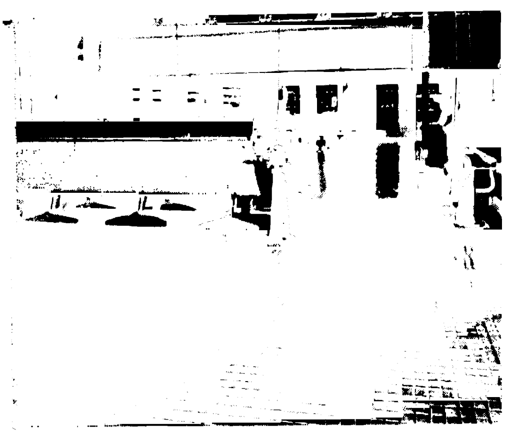
" To-day we have margarines on the market which no one, not even the gourmet, and certainly not the dietician, should be ashamed of eating. They have the texture, flavour, and nutritive value of butter, and seventy years research has gone to the making of modern margarine." *Prof. V. H. Mottram.*

served, but in 1914 it had not been possible to foresee the need for such precautions. Furthermore, the plant of the day was unsuited to large-scale production of packeted margarine, nor was a thorough knowledge of the science of oil refining, and particularly of the hydrogenation of vegetable oils and fats available. The result was an emergency product, which secured for margarine the unfortunate reputation of a war-time makeshift.

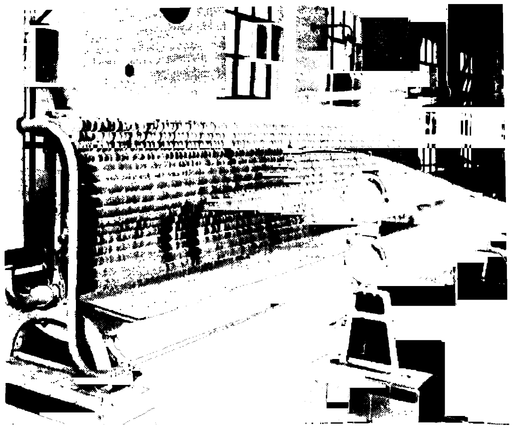
Not for some time after was this handicap removed ; we can all recall at least one occasion on which we have heard disparaging remarks about " bread and marg," but prejudice born of ignorance is rapidly disappearing and by a curious twist of fate the second world war has done more than years of peace-time experience in familiarising an ever larger body of people with the food value of margarine.

In this connection an extract from a letter written during the recent war by Professor V. H. Mottram is of some considerable interest. It runs as follows :—" To-day we have margarines on the market which no one, not even the gourmet and certainly not the dietician, should be ashamed of eating. They have the texture, flavour and nutritive value of butter, and seventy years research has gone to the making of modern margarine. It is not so much a butter substitute as a new food having the majority of the characteristics of butter."

Interesting though this historical background was, time—that hard taskmaster—



The Purfleet Milk Room with its giant tanks. Laboratory tests are carried out to ensure that the milk is up to standard for purity and quality. Before it is used in Margarine manufacture.



Before the milk is used it is first pasteurised and specially treated to ensure that the maximum benefit is given to the Margarine, to which it gives the characteristic delicious, creamy flavour.

would not permit us to linger over it. We realised that we had much to do and see and the sooner we got down to it the better.

Our tour started in the refinery under the guidance of the refinery manager. We had particularly asked to be shown this side of the job first as we wanted to know something about the preparation of the ingredients of margarine. It should perhaps be explained that there are three main sections to the manufacturing process—the preparation of the oils, the preparation of the milk and the actual manufacture of margarine from these main ingredients. The latter stage also incorporates the colouring and vitiminisation of the product.

It is not possible, within the scope of this article, to explain in detail the various refining operations. We shall have to content ourselves, therefore, with a brief summary of the process.

There is, as our guide said when we first entered the refinery, little that can really be seen as, most of the time, the oils and fats being processed are in pipelines, tanks or vessels. Our first question, naturally, were in regard to the actual raw materials from which the oils were obtained and our host told us that they came literally from all quarters of the globe.

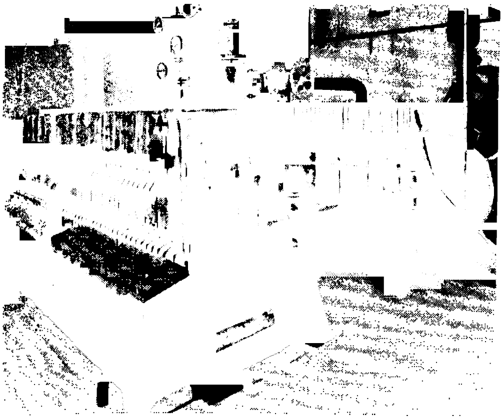
Vast quantities of ground-nut, copra (coconut), Palm oil, palm kernels, soya bean, sunflower seed and other raw materials are processed to extract oil. The standard of quality called for in the refined product is exceedingly high and for this reason the refining processes are conducted with a surprising degree of care and thoroughness.

The purpose of refining, our host pointed out, is threefold : It must remove from the oils all trace of smell, colour and taste. In short the final product must consist of nothing but pure glyserides in bland, odourless and tasteless condition. " The taste of "monkey-nut," pea-nut or even coconut is quite agreeable in its proper place," said our guide, " But you can imagine the effect if it were present in an oil used for margarine.

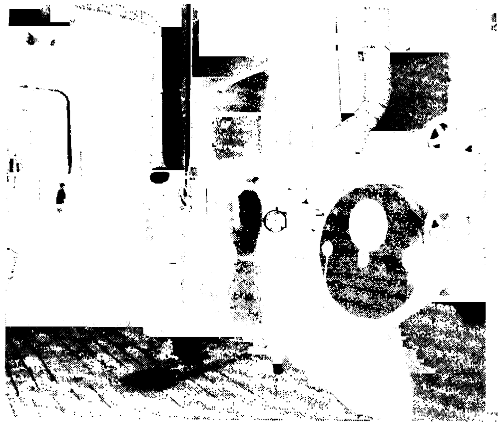
The photographs accompanying this article include some views of the refinery plant and the large scale of the operations will be readily appreciated from the size of the individual units shown.

The crude oil treated in the refinery is a mixture of neutral oil and free fatty acids, with traces of albiminous matter and moisture. As only neutral oil is suitable for making margarine, the crude oil is treated with caustic soda which combines with the free fatty acids and albuminous matter, causing soaps and lye-products to settle at the bottom of the vessel. The clear neutral oil is then decanted and thoroughly washed with large quantities of water to remove any trace of soap or other water-soluble impurities. Drying follows, and the oil is bleached to remove its natural colour.

Having watched the various processes of the refinery and seen the final product on its way to the factory we said goodbye to our guide and, in company with the margarine technologist to whom we had been introduced, crossed to the factory proper. It should be explained that the oil refinery is a self-con-



...egetable oils are one of the prin-...al ingredients of Margarine and ...se are extracted from many ...nds of nuts, thus the ingredients ... Margarine are gathered from ...ant parts of the Empire.



A view in the refinery showing the de-odoriser plant with its valves and controls. Here the purification is carried out and all odours are eliminated from the oil before it is passed to factory.

tained unit operating under separate control from the actual margarine plant and treating oil for several other purposes as part of its daily work. The oil refiner has to satisfy the principal margare maker that the quality of the oils he tenders to the margarine factory is of the highest quality.

In the company of our guide and informant we entered a lift and ascended to the dairy section at the top of the building where the milk is treated and prepared for incorporation with the oils in the last stage—the actual margarine production.

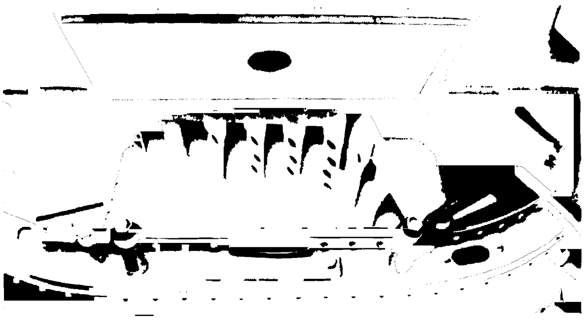
To the visitor a dairy department on the scale found here is somewhat of a surprise. Even to us, accustomed as we are to seeing things laid out on a big scale, it was a revelation. The photographs we reproduce do it less than justice, it must be seen to be believed.

Our guide told us that the milk used is re-constituted dried milk. In pre-war days, he said, a large quantity of local milk was used but in view of the serious shortage of liquid milk this is not used to-day.

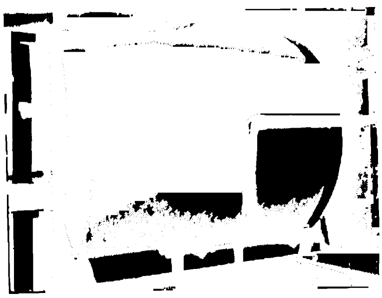
In this dairy, more perhaps than anywhere else, was the extreme extent of cleanliness necessary to a large food factory emphasised. When we remarked on it to our host his comment was: "Bacteria and moulds are stern taskmasters. Any slackness in maintaining hygienic conditions would very quickly lead to disaster. All operations are kept under very strict control for the simple reason that it's the only way to be certain."

The walls of this dairy are treated with a germ-proof coating that may be hosed down daily, the floor is so designed that it can be

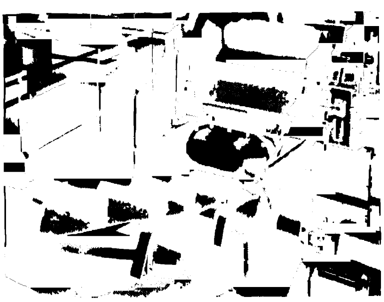
This huge tank-like vessel is part of the neutraliser/bleacher department. It passes right up through two floors. Soaps and lye products are drained from the bottom.



The oils, are run into giant churns together with the milk. Inside each churn powerful blades mix together the ingredients into a rich creamy emulsion of the correct consistency



Revolving cooling drums freeze the mixture which falls into trucks below



The multiplexing process consists of rolling the margarine between sets of twin rollers

Large revolving S shaped paddles beat up the margarine in this final stage

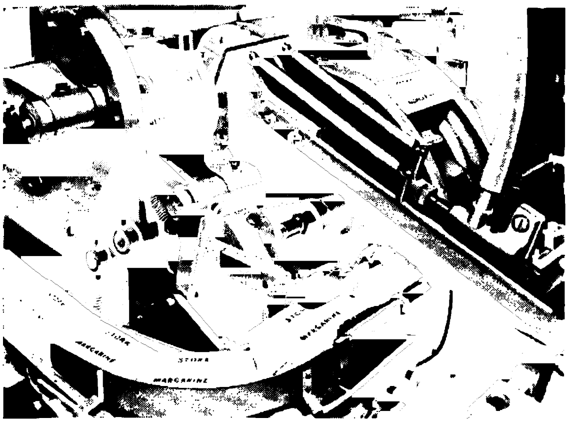
swilled down and all water drains to the sides of the floor area whence it is piped away ; the milk carrying pipework is particularly noticeable in that there are no blind bends or corners Each bend is provided with a cap so that it may be brushed or swilled through The apparatus itself is as clean, sterile and safe as human ingenuity can make it

Into this department comes the milk which is to become one of the constituents of the finished margarine On arrival it undergoes both chemical and bacteriological examinations, following which it is pasteurised cooled and innoculated with a pure standard culture of lactic acid bacilli This culture is of the very greatest importance, because it provides the determining factor in the final flavour and aroma

We were particularly interested in the process and at our request the bacteriologist on duty explained the method in greater detail " We get small supplies of milk from local farms, he said, and we select suitable strains of bacteria to inoculate our test specimens This test specimen if satisfactory, is used to inoculate a container of somewhat larger capacity and that, in turn is used to inoculate a complete batch of several thousands of gallons

Incidentally, this process of treating the milk is used in butter-making by the most up-to-date dairies in the world, which probably explains why it is difficult to differentiate in flavour between modern margarines and butter

We left the dairy and descended to the gallery in front of the big churns which form the first stage of the final processing The interior of one of these churns may be seen among our photographs and it will be noticed that it is equipped with a number of paddles or beaters



After a short rest in the cooling room the margarine travels on to the packing machines. These machines cut the margarine with uncanny precision into half-pound blocks or rolls, and then proceed to wrap it neatly in pure vegetable parchment paper before passing it round the side to the weighing machine.

Into the interior of these churns come the ingredients. First a flush of brine or salt solution, then the milk and oils through separate feeds. (The salt is omitted from unsalted margarine). At this stage also are added the colouring agent (this is one of nature's own colours and the source is red palm oil), and the fat-soluble vitamins A and D. A small quantity of preservative is added, as a safeguard against delay in transit.

From 1927 until the outbreak of the last war, explained our host, no preservative other than salt was used and in those days it was the custom to insert a date slip in the package requesting its return if unsold by a certain date. According to our host it was normal for the product to be on the table within 9-10 days of manufacture. The period, even now, is only reckoned to be about 3 weeks. During the war, however, up to three months supply was stored and the authorities authorised the use of a minimum amount of preservative.

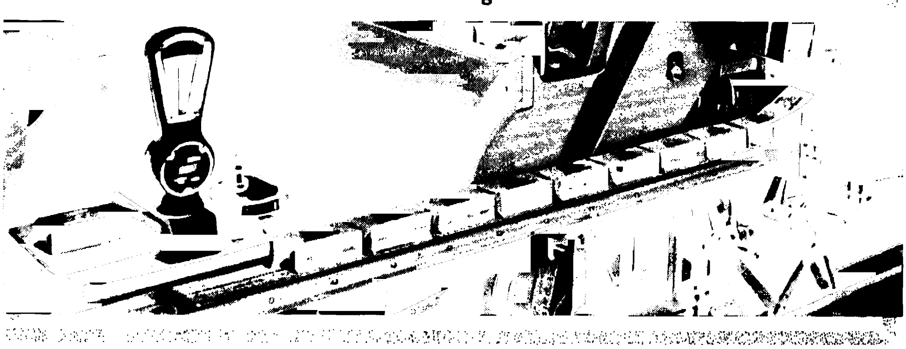
We asked our guide to tell us something about the vitamins and how and why they were incorporated He gave us the following explanation; we feel we cannot do better than pass it on as it was explained to us.

Most of the work has been done by studying the growth of rats when fed with the various fats, and experimenters have based their conclusions on the assumption that a correlation exists between the digestibilities found in human adults and those found, for the corresponding fats, in rats.

Now rats and men are both omnivorous and the anatomy of their gastro-intestinal tracts is similar and as far as fats are concerned, conclusions based on rat experiments are, therefore, justifiably applicable to humans.

In 1912 Sir Frederick Gowland Hopkins had found that Wistar rats died when fed on purified foods, whereas on a diet of the same quantities of crude foods they flourished. Although the existence of vitamins had been indicated as long ago as 1881 by the work of Lunin at Basel, it was not until after Sir Frederick's researches that their nature and functions came to be fully understood.

Then, and then only, are the packets touched by hand, for as they come off the packing machines a careful check is made that the weight is correct.



MISCELLANY

COMMERCIAL GAMMA RAY ORGANISATION

APPLICATION of radium to the examination of metals, weldings, pressure vessels, etc., is the purpose of a subsidiary company, Gamma Rays, Ltd., Smethwick, formed by Commercial X-Rays Ltd., whose mobile X-Ray service has a penetration of only 1½ in. to 2 in. of steel and their laboratory service 3 in. to 4 in. sections. Industry is requiring now the examination of much thicker sections on site. Gamma Rays are a development of radiography and represent considerable advance in portability and depth of penetration. Clear internal photographs of metal sections up to 9 in. thickness can be obtained; the radium sources are so constructed that they can be used in positions totally inaccessible to any other means of inspection. It is not necessary to dismantle the structure to be examined; Gamma Rays are portable and can be taken anywhere in the British Isles. The service, the first of its kind to operate in this country, is self-contained, taking its own dark room and film processing unit to each works as required. Charges compare favourably with those for X-Ray work on much thinner sections.

ELECTRIC KITCHEN EQUIPMENT DESIGN

KITCHEN Design in Small houses is a matter which had advanced rapidly in the degree of recognition of its importance. And rightly so. It would be a poor reward for housewives, after all they have gone through in the last six years, to offer them permanent homes incorporating a permanent low standard of equipment in the kitchen, the hub of the home. It would be rather ironical also should kitchens in new permanent homes be less well equipped than in the so-called pre-fabs. Yet there is a fear in some quarters that this may be the case.

A helpful 12-page illustrated booklet, "Electric Kitchen Design for Small Houses" has been issued by the British Electrical Development Association. The author is Mr. A. L. Osborne, the architect, and he sets out what may be termed the core of a consistent plan for the average semi-detached home of the future.

Reference is made to an anomaly which has been consistently overlooked. That is, that even if the kitchen in one house of a pair has been correctly planned with the equipment in the right position and sequence, its opposite number will be reversed. In other words, half the housewives will be called on to work more or less left-handed.

A kitchen design is shown to overcome this. Major items of equipment which "everywoman's" kitchen should contain are set out as: electric refrigerator, electric water heater (storage type), electric washing machine or wash boiler, electric drying cupboard, sink and draining boards, ventilated food and vegetable stores, grocery and dried foods store, china, glass and utensils stores, space for general storage, saucepans, etc., drawers for cutlery, table linen, etc., store for vacuum cleaner, brooms, cleaning materials, etc. Adequate counter space for the preparation and service of meals should be provided.

A point emphasised in the booklet is that all the necessary components for the kitchen described are now in production so that new permanent houses can have the same standard of equipment and all the labour saving amenities which have become the accepted standard of temporary housing.

MECHANISATION PLANT EXHIBITION AT OLYMPIA

IT is typical of the present day demand for mechanisation in all phases of industry where this is possible that the first national Mechanical Handling Exhibition and Convention is to be held at Olympia, London, from July 12 to 21 this year.

The slogan of the exhibition is "Mechanisation speeds production . . . . . spells prosperity" and special arrangements have been made through the Board of Trade Export Promotion Department to contact overseas buyers. Included in the exhibits will be every type of power and hand-driven

handling plant, equipment and accessories from aerial ropeways and elevators to wagon tippers and pneumatic plant. Organised by the Iliffe group journal "Mechanical Handling," the exhibition is supported by the leading trade associations affected.

Sir Stafford Cripps, welcoming, when President of the Board of Trade, the proposal to hold the exhibition, said it would demonstrate the progress which is being made towards the solution of one of our big production problems—shortage of manpower.

"Mechanical handling of raw materials and materials in progress through the works increased output per head, reduces fatigue, improves methods of production and cuts down manufacturing and overhead costs," wrote Sir Stafford.

One special feature of the exhibition will be a film dealing with the application of mechanical handling in the main branches of industry, together with other films dealing with varied aspects of mechanical handling. It is hoped to provide facilities for screening exhibitors' own films ; those wishing to take advantage of this should submit details to the organisers.

The stress which is laid on the world publicity which is being given to the exhibition is a tribute to the British grasp of how vital is the necessity for a wider extension of mechanisation in industrialism in both the material and the human aspect.

The demonstration of the efficiency of British-made plant and equipment and the wide field it covers should aid the extension of our export markets. Mechanisation plant and accessories stand high among the urgent requirements to rebuild and reconstruct the war ravaged areas of the world.

Concurrently with the exhibition there will be a convention planned to be of practical value to visiting industrial buyers which will demonstrate the technique of mechanical handling methods as applied to production.

Leading technical experts will address the convention from both the manufacturer's and the user's point of view. An industrial film programme will be also included.

BRITISH GOODS IN COPENHAGEN EXHIBITION

To encourage export trade to the Scandinavian and neighbouring markets an xhibition of British manufactures will be held n Copenhagen from September 18 to October next. It is being organised by the British nport Union of Copenhagen in consultation with the Federation of British Industries. Exhibits will include products of the engineering, chemical, building and associated industries, textile and miscellaneous industries, and transport, including motor cars and motor vehicles. It is hoped to arrange suitable sites on the outskirts of Copenhagen for the display and demonstration of British aircraft. Manager on the British side is Mr. G. H. Meadmore, formerly secretary of the British Industries Fair.

CAR BODY DRYING PLANT

A CAR stoving plant known as "Rapiradia" had been designed and is in manufacture by Messrs. Stewart Gill & Co Ltd., of Fairfax Road, Teddington, Middlesex.

By a combination of a tunnel oven heated by gas-fired Infra Red apparatus and a special conveyor layout, car bodies, when passed through this plant, are equally exposed to radiation on all surfaces, and by the use of suitable synthetic finishes complete drying of each coat may be attained in a little as six minutes.

The use of gas as a heating medium permits of flexibility in temperature control—by controlling individual heaters in various parts of the unit, adjustment of radiation to suit the mass and size of bodies may be achieved. Tunnels may be constructed employing electrical or other methods of heating, where manufacturers so desire. The system is economical—a one-coat finish on a typical light-car body has been cured in six minutes at a gas consumption of .6 therms which, at 10d. per therm, represents a cost of 6d. per body. "Rapiradia" Plants may be installed with existing horizontal conveyor tracks.

A car body is here seen entering a "Rapida" oven

Continued from page 47

Normally, exporters from this country obtain payment for their exports in one or other of the following ways :—

1.—By the direct transmission of the shipping documents accompanied by a bill of exchange drawn on the overseas buyer.

2.—By handing drafts accompanied by shipping documents to a banker with instructions to remit to foreign correspondents for presentation to and payment by the overseas buyer.

3.—By irrevocable documentary credits established by the overseas buyer in favour of the British exporter.

Unless the utmost trust and reliance can be placed on the foreign buyer, and it is certain that his financial position is strong, method (1) is not recommended as a safe procedure. The financial side of export is still governed by Defence (Finance) Regulations which are issued from time to time. Importers pay in the currency of their country ; the manufacturer in this country receives sterling ; the operation of the transfer is governed by exchange agreements between the Governments, and these agreements vary in accordance with the conditions. Payments are made out of the sterling resources in London belonging to, or standing to the credit of, the importing country, and if there are no such resources there would probably be no permit to export.

Protection against loss

Under cover of an Export Credits Guarantee Department (Contracts) Policy, the exporter is protected against loss due to insolvency or protracted default in payment on the part of the buyer ; exchange restrictions in the buyer's country which prevent the transfer of sterling to the U.K. ; the occurrence of war between the buyer's country and the U.K., or of war, revolution, etc, in the buyer's country ; and the cancellation or non-renewal of an export licence, or the imposition of restrictions on the export of goods not previously subject to licence. Sales of plant, equipment and heavy machinery are normally the subject of special contracts providing for progressive payments with longer credits than are customary in the case of consumer goods, and where guarantees in connection with such contracts are given it is usually necessary to issue a special policy to meet the particular circumstances of each individual transaction.

In the event of alterations being made in the value of sterling vis-a-vis the American dollar, some currencies would not necessarily follow the same course as under the old set-up. The nations will have to assist each other to overcome their short-term exchange difficulties, and it is possible that before long a common pool will be provided by international agreement from which monetary requirements can be drawn by individual countries at agreed rates of exchange. In this connection it is necessary to emphasise that when measured in terms of money, an excess of imports is dangerous when they can be obtained only from monopolistic sources and are unbalanced by reciprocal exports.

Customs in overseas markets differ considerably, and those British firms who are new to the export trade, or who are proposing to reorganise their arrangements, should carefully study the various methods.

In some countries—West Africa, for example—both export and import business may be in the hands of the same organisation, and a large market like India requires a different approach from that to a small territory like Panama. Some risk will, of course, have to be taken, and it may become increasingly difficult to obtain cash terms, and exporters should endeavour to make contacts with local commercial heads, banks, and other sources of information concerning the financial standing of buyers of U.K. goods.

British producers should decide for themselves the particular channels along which their foreign customers can best be served.

Direct sales to customers abroad should preferably pass through a shipping agent who is experienced in dealing with the particular market, and if the sales consist of small quantities, arrangements can then be made to ship them with other goods leaving for the same destination. Bulk shipments under a general bill of lading may considerably minimise the cost, and the agent can attend to customs matters, consular invoices, etc. Many overseas buyers prefer to deal direct with the manufacturers, but dealings with unknown or unreliable buyers should be avoided. The sending of travellers might overcome some of the difficulties, but some form of local representation is nearly always desirable.

Where the demand or potential demand for specific products is small, manufacturers may substantially increase their turnover by selling to export merchants in this country, while at the same time assisting in the promotion of sales by personal visits to ultimate buyers. The volume of business transacted through merchants having the sole export rights in particular markets, however, may be seriously restricted by the merchant's financial

capacity, and in such cases it is often possible and profitable to grant extended credit. In dealing with backward or undeveloped countries, where the greater part of the demand is likely to be for a homogenous selection of finished articles, or when only very limited ranges are available for export, the services of a merchant who has not the sole export rights in the market concerned may produce satisfactory results, but it is rare that a large and expanding trade can be captured in this way.

The main drawback associated with the sale of plant, equipment and machinery to foreign branches or depots established in this country is that spares and replacements may be difficult to get in sufficient regular quantities. There is also the danger of trouble in the matter of commission payable to the exporter's overseas representative, although if the transactions can be separated there would seem to be no valid reason why some of the servicing should not be done in the importing country. This, of course, would have to be adequately provided for in the agency agreement.

Importing merchants

Then there are the importing merchants overseas, with and without sole rights. If certain merchants hold a dominant position in different areas, the manufacturer may with advantage often deal with two or more in the same country. Friction can easily arise over selling prices and methods of payment, and when this happens it is practically impossible to carry out any organised plan. Much depends, of course, on the size of the exporting firm, the nature of the goods, and the agreed margin of profit for the merchant, and while economies could nearly always be effected in freights, arrangements of this kind demand a good deal of friendly co-operation.

In addition to selling, the merchant would have to support an organisation which would be capable of advising manufacturers of the current requirements in the various areas, and would naturally expect to be guaranteed reasonable continuity. There are many importing merchants overseas, possessing adequate financial resources and keen ability who are quite capable of securing and maintaining a large turnover at a very reasonable margin of profit for themselves, and if they go out and get orders and not just wait for them to come in, British exporters should not hesitate to do business with them. Many have technically qualified staffs.

The employment of commission agents who stick to a limited range of goods of which they have some definite specialised knowledge is often a satisfactory arrangement. Even then, it is advisable to make independent enquiries into new accounts, and of course commission should be paid only on the orders actually shipped and paid for. A greater volume of turnover can sometimes be attained by appointing agents with plenty of stock under their control, but then again if these are exported in increasing quantities on consignment, the duties and charges will be relatively heavy and there is the risk that considerable quantities will remain unsold, or that prices would have to be reduced.

Commission agents with stocks under outside control are usually able to exercise an effective check, and if certain descriptions are held in free ports they are available to buyers in the adjacent territories, and customs duties can be avoided. The objections to allowing agents to control consignment stocks on a commission basis apply in greater or lesser degree to sole distributors, though these may stock for their own account.

Many individual manufacturing firms in this country have already made some valuable preparations for the effort which is needed to ensure that many of the goods hitherto imported are produced here. New designs have been drawn up, and the production of prototype machines is proceeding side by side with experiments in the use of new materials and the reconditioning of jigs and tools, but many countries are moving rapidly towards self-sufficiency. The majority are willing to exchange their staple products for our goods, and for a long time there is likely to be an enormous demand for machinery, locomotives, motor vehicles, wireless sets, and high quality textiles.

Some of the new states in Europe are not yet sufficiently organised commercially to offer easy openings, but as these markets gradually but surely become more stabilised, their requirements will be wide, varied and regular, and a great change is coming over our handling of the colonial question.

Before the war, the colonies were the largest free-trade areas in the world, and they derived only a quarter of their imports from Great Britain. For the ten-year period ending 1956 large grants have been made towards the development of backward populations, and these will supplement their own efforts. Bigger schemes are contemplated, and with the aid of science and technology vast opportunities will be opened up, raising the whole level of productivity and creating a spiral of higher standards all round.

Electronic Inspection

The application of electronic techniques to industry is extensively surveyed, with the primary object of stimulating interest in the use of such techniques as an aid to industrial efficiency as it is felt that many industries have not yet been made aware of the versatility and great possibilities of this new branch of engineering.

THE FOURTH ARTICLE OF A SERIES BY D. M. SWATTON

THE previous article of this series dealt briefly with application of electronic principles to certain techniques for making consistently precise measurements essential to industrial research and production. Although those techniques discussed are utilized to advantage in various activities, they are generally of interest only to industries concerned with engineering and scientific products, which have to be individually dimensioned within very fine limits, or processed under exactly controlled conditions, with supervision by skilled personnel.

In many industries, the requirement is not so much for precise individual measurements as for automatic determination of size, condition, or quality, to facilitate the inspection of products manufactured at high rates by comparatively unskilled labour.

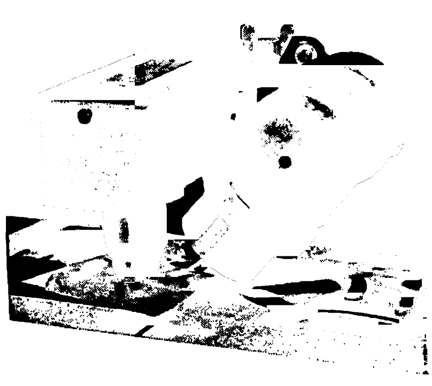
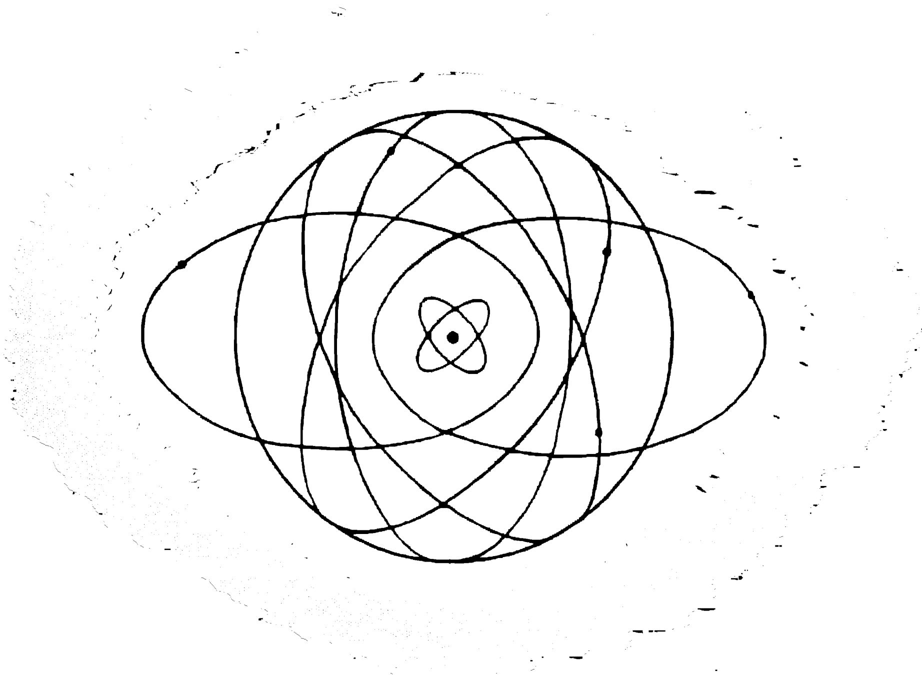


Fig. 1—Photo-electric scanning head showing relationship with register mark on sheet.

The present article is a review of electronic inspection techniques developed for a variety of industries. In general they are the practical application of the electronic principles already discussed.

For the automatic gauging of repetition parts a number of electronic methods are available. One method depends on the variation of capacitance, and uses the oscillating valve arrangement of the electronic mircometer. The inspection of parts machined to small tolerances is carried out with a series of jigs, each of which is fitted with small electrodes adjusted to give a particular value of capacitance corresponding to a particular dimension. When the part is placed in the jig between the electrodes, it varies the oscillatory frequency according to the dimension between the electrodes. If the dimension is within the limits, the frequency has an appropriate value, and the part is accepted by a frequency discriminator. This operates in conjunction with a relay system so adjusted that if a dimension is greater or smaller than the predetermined value, an indication is given of the discrepancy. The relay

INDUSTRIAL APPLICATIONS OF ELECTRONICS



system can be made to control mechanism which, as the part travels along an inspection line, drops it into a rejection bin, selected from a number according to the particular defect of the part.

With this type of equipment almost any property of a large number of similar parts can be inspected by automatic equipment which effects a great saving in labour, and eliminates the human element.

The variation of the inductance of a coil is also used to operate oscillating valve inspection devices.

At radio frequencies the inductance of a coil is appreciably effected by the nature of any substance inside the coil. For example, a coil wound on a hollow former with air inside it, will have its inductance greatly increased if an iron rod is inserted. Similarly, some pronounced difference between two iron rods will result in different values of inductance.

The principle of variation of radio-frequency ıductance is used for the rapid indication the existence and depth of cracks in ferrous d non-ferrous materials. An instrument is ibrated from known standards, and an eration of frequency due to the presence of a crack is employed to operate frequency ective relays controlling an indicator which ws the depth of the crack.

The same principle is used for detecting small foreign metallic bodies in foodstuffs. They are passed through a radio-frequency coil, and the presence of metallic particles is indicated on an instrument operated either by a change in frequency, or a change in the R.F. resistance of the coil, which alters the amount of current flowing.

For many industrial purposes it is necessary to check the moisture content of materials or commodities. As the presence of moisture has a direct effect on the electrical properties of any substance, it becomes practicable to inspect for moisture content in terms of direct electrical changes.

A simple type of electrical hydrometer has a detecting element of paper impregnated with potassium acetate. The resistance of the element when wet is ten times that when it is dry, and this variation provides for a direct indication of relative humidity.

Variation in the capacitance of a condenser with changes in the moisture content of substances between the plates, is also used to indicate humidity. An instrument has been developed for measuring directly the moisture content of materials such as grain, seeds, tobacco, wood, and wool.

An outstanding example of the practical application of an electronic technique for determining moisture content is the Fielden Drimeter, devised for the textile finishing

trade. The fabric passes continuously through two electrodes, forming a condenser, the capacitance of which varies in accordance with the moisture content. The instrument makes it permissible to increase the running speed of the drying machine, by eliminating empirical methods of testing and the delays occasioned in applying them. It can, if required, be applied as the control element for automatically varying the speed of the machine according to the moisture content.

As a direct substitute for human visual inspection, either for the judgement and selection of products, or the control of processes, the photo-electric cell has the advantages of greater discrimination, and no psychological time lag. It can be applied, in conjunction with appropriate electronic equipment to almost any task—although in certain circumstances it may not be economical to do so.

A simple photo-cell application of great utility in many industries is for the counting of mass produced parts or articles of diverse types. Counting is effected by the momentary interruption of a light beam, which results in the operation of an electronic relay that actuates a Veeder-type counter for interruption rates not greater than 10 per second, or uni-selector counters for impulse rates up to 50 per second.

Apart from merely counting, a photo-cell system can be devised for the automatic sorting of articles, packages, etc., according to some colour distinction, which may indicate a particular condition or grade. Even when there is no humanly observable colour difference, the method may still be applicable, for the photo-cell has about two-hundred times the colour discrimination of the eye.

Photo-cells can be arranged to maintain continuous supervision and control of paper register, in machines for wrapping, bag-making, cutting-off and so forth, when the paper carries a printed design that must appear in the correct position.

The individual wrappers or designs are usually cut off by a rotary cutter from a continuous sheet of paper fed into the machine from a pre-printed reel. Although the cutter and design may be in register at the start of the reel, small errors in pitch between designs, due to uneven stretching of the paper, will accumulate and cause a serious discrepancy of register. This must be corrected by a momentary change in the speed of the cutter with respect to the paper, or vice versa. A tolerance in the position of the cut with respect to the design must be accepted,

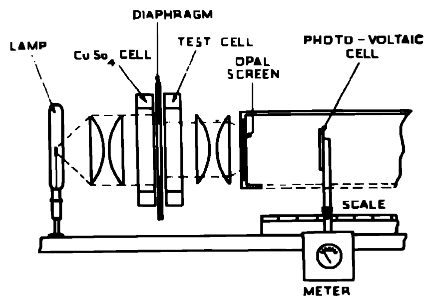


Fig. 2—Device for measuring the opacity of solutions or liquids.

Fig. 3—Beverage inspection device. The lamp and lens system sends a strong, narrow beam of light through the length of the bottle into a bank of photo cells, any obstruction operates the reject pusher.

and can usually be of the order of plus or minus one sixteenth inch.

Electronic control enables this correction to be done automatically, and at much higher speeds than with manual control.

A black " spot " is printed as a register mark on the sheet, and when the registration is correct, covers a narrow aperture in front of a photo-electric cell, as shown in Fig. 1 The edge of the paper is illuminated by a projector, so that light is reflected into the photo-cell except when the spot is directly in line with the aperture.

While the paper is moving illumination of the photo-cell has no effect, because a cam-operated switch driven from the cutter shaft remains open to prevent the electronic amplifier coming into action. At the instant that the motion of the sheet is stopped, and the spot ought to be beneath the aperture, the cam closes the switch to energise the amplifier. If the register is incorrect the photo-cell remains illuminated, and applies a voltage to the grid of an amplifier. The control equipment is then operated automatically to adjust the machine to correct register.

Electronic equipment is being used to advantage for register control of high speed colour printing on rotary presses. To obtain good results it is necessary that the displacement of one impression with respect to the other must not exceed 0.005 in. This degree of control can readily be effected by electronic means. For one system a number of closely spaced register marks are printed by the first impression cylinder. Each succeeding cylinder is provided with discs having a series

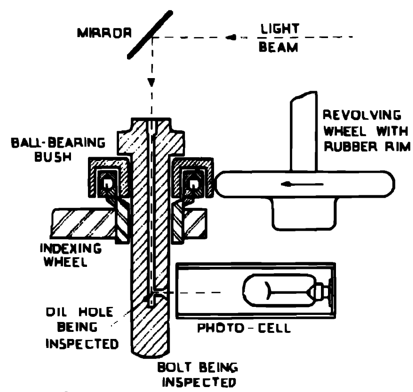
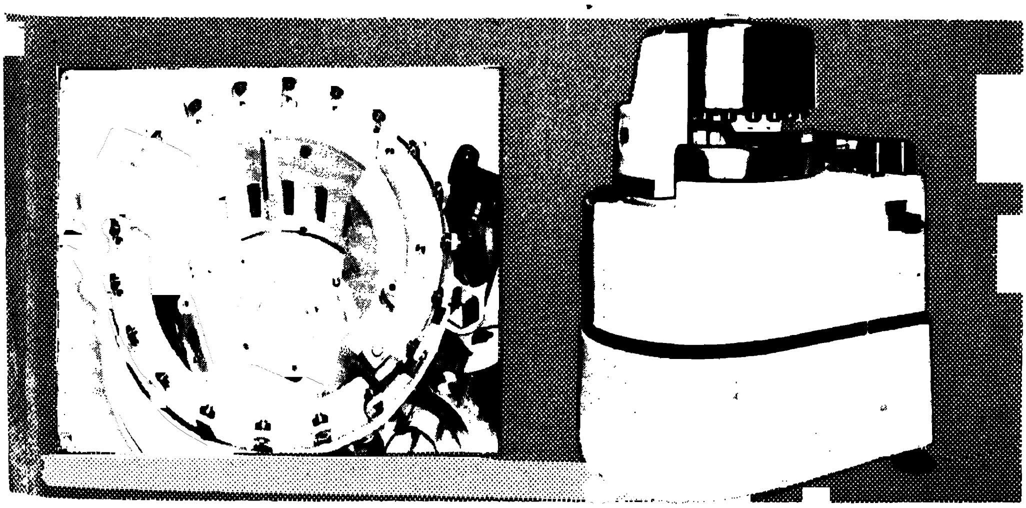


Fig. 6—Inspection of oil holes in machinery components.

of slits spaced at intervals equal to those of the register marks. Two photo-electric scanning heads are provided for each cylinder, one for the register marks and one for the discs. The spacial relationship between marks and slits are compared electronically and corrections made by a momentary acceleration or retardation or the printing cylinder, depending upon whether the register marks lead or lag behind the slits. The correction to the printing cylinder is made through a differential gear box operated by a small reversible motor. Corrections are made as soon as any error in register is detected.

Photo-electric cells are being applied for the measurement, inspection, and comparison of the condition of liquids. One arrangement for measuring the opacity of solutions in chemical analysis is illustrated in Fig. 2. The photo-cell used is a special type, which has the

Figs. 4 and 5.—Two views of the R.C.A. inspection machine shown in diagrammatic form on page 70. The device detects and rejects bottles containing foreign matter, solids or dense solutions in the bottle.



advantages of robustness and long life, and does not require an external electricity supply. The scheme uses light from a lamp source, which is passed through a filter consisting of a 4 per cent. solution of copper sulphate to reduce infra-red radiation. A test cell is interposed and the illumination on an opal screen is measured by the photo-voltaic cell. Concentration of the test solution is measured by reference to calibration charts obtained previously from known samples.

A device such as that shown in Fig. 2 can be used for the inspection of products such as paints, dyes, inks, glues, to compare the shade of colour with a pre-set standard. This form of device can be operated without fatigue by unskilled personnel to differentiate shade to limits well beyond the capabilities of the human eye.

Other methods can be employed in the production of photographic film to detect flaws and blemishes on the emulsion, and in the chemical industry for accurate titration, the manufacture of jams and jellies, the refining of sugar, and the sterilization of food.

An interesting example of the photo-electric inspection of bottles of Coca-Cola is shown diagrammatically in Fig. 3. The inspection equipment forms part of the machine, shown in Figs. 4 and 5 in which the bottles travel around in a circle, and are at the same time spun at high speed so as to produce turbulence in the liquid. The object of this is to cause movement of any particles that may be present, so that they can be detected by passing across a beam of light projected through the bottle and on to a bank of photo-cells.

Just before each bottle arrives at the inspection point, still spinning at high speed, it is quickly braked to a standstill. Because of the momentum, the contents continue to whirl rapidly, and as the bottle is exposed to the light beam, any particles passing across it will reduce the illumination of the bank of photo-cells. A minute change of illumination results in the operation of the amplifier, which energises a selector mechanism for rejecting the bottle.

Using photo-cells, the uniformity of surfaces, and thin sheet materials can be inspected optically. With translucent substances, their light transmission characteristics are dependent upon uniformity, so this may be inspected by passing the material between a light source and a photo-cell and integrating the variations in light intensity. When the uniformity of a surface can be defined in terms of its optical reflection co-efficient, variations of the reflected light illuminating a photo-cell can be used to assess the degree of uniformity of the eflected light illuminating a photo-cell can be used to assess the degree of uniformity of the surface.

Electronic methods of inspection are available for detecting uneveness of surface of a variety of materials, and in coatings of paint and resins on opaque surfaces, in enamelling on metals, and for similar purposes.

Photo-electric techniques are particularly advantageous for superseding tedious inspection jobs where carelessness is likely to occur due to the operative's eyes becoming tired. A typical example is the inspection of small holes in repetition parts. By passing a light beam through the hole, and suitably arranging a photo-cell, inspection can be made automatic.

Fig. 6 shows an arrangement for checking whether an oil-hole has been drilled correctly in a shackle bolt. The bolt is rotated by a continuously running wheel, and if the hole is clear a pulse of light falls on the photo-cell. If the hole is blocked no pulse is received, and this results in the operation of mechanism to drop the bolt into a rejection bin as the indexing wheel rotates.

In this article, an attempt has been made to indicate the wide field of application of electronic inspection and control techniques, but the examples quoted do not by any means exhaust the existing and potential applications. The discussion will be continued in the next article.

Books

NATIONAL INSURANCE: *by John Gazdar. Published by Stevens & Sons, Ltd.* 74 pp., price 3/-.

This book adds another new title to the excellent "This is the law" series. In clear and concise language it explains to the man-in-the-street what his position will be when the Act comes into operation in July, 1948—and also what benefits he may expect to obtain therefrom. It should prove a useful little reference book for personnel managers and the like, in explaining points of national insurance to the staff.

continued from page 63

Vitamins were found to be of two types, those which were soluble in fats and those which were soluble in water. Later, two fat-soluble vitamins were identified and these came to be known as A and D ; they were established as being of the very greatest importance. Proper growth and development of the body cannot occur without an adequate supply of vitamin A, shortage of which affects the eyes and leads to night blindness. Lack of vitamin D, which was shown to be essential to the promotion of healthy bone formation and the prevention of decaying teeth, was discovered to be associated with rickets. General deficiency of two fat-soluble vitamins causes susceptibility to influenza, tonsilitis and colds and generally lowers the body's resistance to infection.

Butter, among other animal fats, proved to be a source of these vitamins, which are formed by the action of sunlight on the cow and its food. (Hence their popular name, the " Sunshine vitamins."). Margarine was for many years behind butter in connection with its vitamin potency, and consequently, unless the margarine itself is fortified with vitamins, the diet will be deficient to that extent when butter is replaced by it.

For some years before the last war some manufacturers were adding vitamins to their margarine, but, this first of all necessitated a great deal of collaborative work between the vitamin and the margarine experts. Much research work was necessary on the extraction of the vitamins from fish livers, so as to produce a tasteless oil of high potency. Vitamin D was also obtained by purification of irradiated sterol.

In concentrate form these vitamins were not sufficiently stable to withstand the exposure to air and the heat to which they were necessarily subjected during the refining and treatment of the oils used in the manufacture of margarine. It took some eight years of intensive research before the problem was finally overcome.

Since 1927 leading brands of margarine have contained vitamins A and D in the same proportion as they are found in good butter. During the late war the Government made it compulsory for these vitamins to be included by all manufacturers and to-day table margarine contains, by order of the Ministry of Food, 450-550 I.U. per ounce vitamin A, and 90 I.U. vitamin D per ounce, which is equivalent to 15.9-19.4 I.U.A. per gram and 3.2 I.U.D. per gram. This is where margarine, by having this specified potency throughout the year, is definitely superior to butter which in the winter has often a very low vitamin content.

Compare that with a recent assay of 16 samples (taken at monthly intervals) of Scotland's butter that gave an average vitamin A figure of 19.7 I.U. per gram, but in April gave only 8.0 I.U. per gram, while for vitamin D it gave an average figure of 0.32 I.U. per gram which in the winter fell as low as 0.08 per gram.

Whilst our guide had been giving us this information the big churn had been mixing the oils and milk into a creamy yellow emulsion. We stepped down to the lower platform to watch the next stage. From the churn the emulsion was run into a trough equipped with a roller and in contact with this roller is a huge drum the interior of which contains a refrigerant solution.

The surface is maintained at a temperature of minus 15 deg. C. Consequently, after travelling once round the drum, the emulsion had been converted into a solid layer which is shorn off by scrapers, to be received below in wheeled aluminium containers.

The margarine is now in its first stage as a solid, and the containers are permitted to stand for a while to allow the flakes to recover from the shock of sudden violent cooling. At the same time the gradual rise in temperature causes the oils and fats to absorb more of the flavour and aroma of the milk.

The next stage is the " working " or plasticising of the product which is undertaken by a series of pairs of rollers running at different speeds in relation to each other and each a little closer in to the other i.e. 1/10 in. gap, 1/12 in, gap and finally 1/16 in. gap. From these rollers the margarine is fed forward by worm screws through a cutter and on to a conveyor belt from which it goes on to a paddle table for further texturating, and swept into smaller containers and removed to a maturing room for a further rest period.

Emerging from the maturing room, it now goes to the big blending machine which gives it the pliability necessary for easy spreading whilst imparting a final touch to the texture, at the same time giving a very bright appearance. Here the moisture content is checked and, if necessary, adjusted (by law the maximum moisture content of margarine is fixed as that of butter, i.e. 16 per cent.).

According to its ultimate destination the product goes one of two ways. If for bulk packing in 14 or 28 lb. or similar cartons it

goes to a special circular conveyor system which takes it to a number of packers. If for packing in smaller units it goes to the packing machine line. Here we saw a large battery of packing machines ; one side of the department is equipped with the older German machines and the other side has been re-equipped with modern British machines.

These machines take in loose margarine at the hopper, and paper at the side, to turn out an accurately shaped, sized and wrapped packet which is checked on a scale as it leaves the machine.

As we left the last packing machine we entered a section formerly devoted to box-making and which is now turned over to what our guide referred to as C.R.S. (container recovery section a new war-time department necessitated by the shortage of packing material). Here cardboard cartons were being examined, old labels and sealing tapes stripped off and the cartons prepared for re-use.

We left the factory via the loading sheds and paused to watch the lorries and railway trucks being loaded and despatched. As we walked back to the offices we discussed margarine legislation with our guide and again learned some interesting facts.

There are various laws governing the manufacture and sale of margarine. Although it does not apply in days of rationing, not more than 10 per cent. of butter is allowed to be incorporated in margarine.

Just previous to the outbreak of war a new law was prepared making it necessary, when margarine was sold as containing butter, to state on the wrapper the butter content ; a 2 per cent. margin was to be allowed. This was to safeguard the public as margarine was often sold as containing butter, in order to bring a higher price, but would only contain about 2-3 per cent, and this was in competition with other margarines sold at the same price but containing 8-10 per cent. The amount of margarine sold of this kind pre-war was, in fact, a very small percentage of total sales.

On wrappers a Brand name may be used combined with the word MARGARINE in the same size and type and colours. The nett weight must also appear. The boxes must be marked on all sides, top and bottom with the word " MARGARINE " using not less than ¾ in. lettering and if a Brand name is printed on containers it must be in the same size and type and colours as the word MARGARINE. Margarine must not be sold by any fancy name which is in any way suggestive of butter or anything connected with the dairy interest.

We also asked what the distribution arrangements were and learned that, irrespective of make or brand, all cooking fats, margarines and compounds are at present distributed through the Central organisation known as " MARCOM " and there is no immediate prospect of any return of individual brand names.

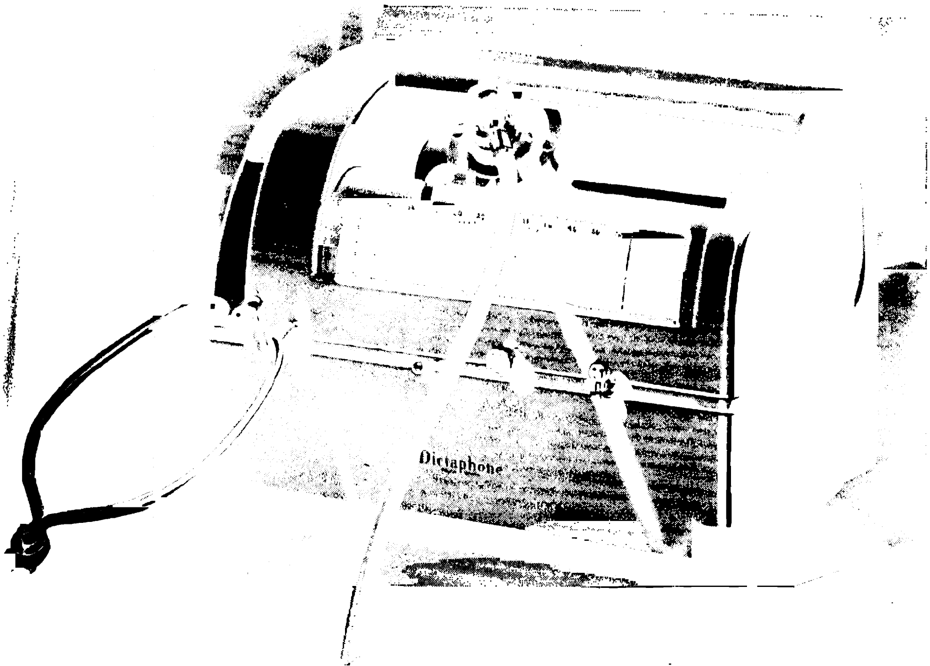
There was one other question we put to our hosts as we said goodbye. We had noticed that although most dictionaries give alternative pronunciations for the word " margarine " everybody at the Stork organisation used the hard " G." Was there, we asked, any special reason ?

The answer given us was that it should be pronounced with the " G " hard, as in the name " Margaret," the derivation being from the Greek word *margarites* (a pearl), the reference being to a stage in the original Mege-Mouries method of manufacture at which an emulsion was formed resembling a " cascade of pearls."

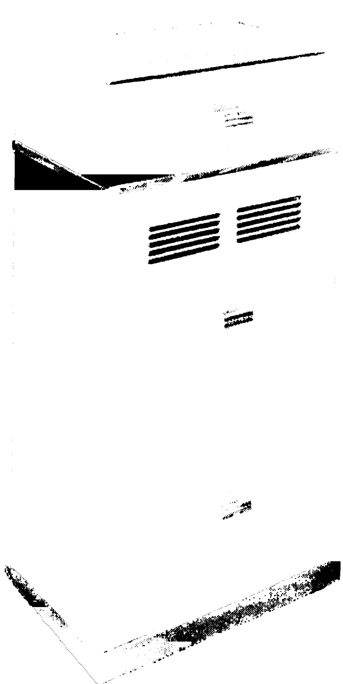
MASS PRODUCED FISHING VESSELS

On the San Sebastian River in St. Augustine, Fla., shrimp trawlers and fishing vessels of various types, from 50 feet to 70 feet in length are being launched at the rate of one a week from the yard of Diesel Engine Sales Co. Inc. This steady production is maintained by having eight boats under construction at all times. Regular assembly line methods are employed and each crew has its own specific job. Every Monday a new keel is laid and in six weeks the vessel is launched.

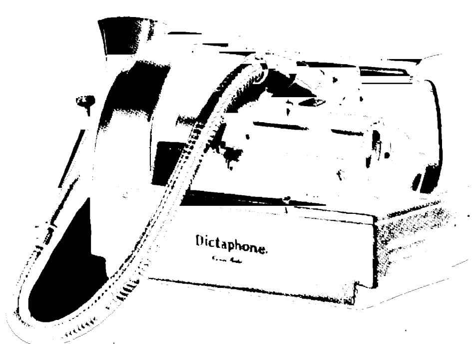
Once the keel is laid, construction rolls on with the bow-stem, shaft log, stern, etc., being assembled in the first week. The following Monday framing and ribbing commence, and by the third week the boat is ready for floor timbers, engine beds, deck beams and decking. During the fourth week the vessel is planked and the pilothouse laid out. Ceiling, bulkheads and flooring are put in, the pilothouse finished, and the boat painted on the fifth week.. The next two weeks see the trawler launched, her engine installed, all rigging completed, and she is ready for delivery to her owner.



INDUSTRIAL DESIGN AND PRODUCT STYLING AESTHETICS



These three units, all products of the same Company, exhibit evidence of really careful attention to detail and inherent quality of design. The top one is the transcribing machine, the lower one is the dictating machine, and on the left is a special cabinet designed for Dictaphone equipment storage.



PLASTICS

by W. S. PENN, B.Sc.

CLOSELY associated with plastics are synthetic rubbers. They are made by exactly the same processes and come under the general heading, with plastics, of high polymers or long chain molecules. As such, it is proposed to describe them since they have many valuable applications in industry. First of all, however, it is necessary to explain the present position regarding synthetic rubbers since no doubt the reader will often have heard that " synthetic rubbers " are no good and will be or have been replaced by natural rubber.

Present Status.

During the war when the principal source of natural rubber in the Far East was cut off, it was decided to produce a general purpose synthetic rubber to replace this. The name given to this material was GR-S, made by copolymerising butadiene and styrene. This material was produced on a very large scale and at the peak period was being made to the extent of over 1,000,000 tons per annum.

Unfortunately it was never as good as the natural product but it did nevertheless serve as an effective wartime substitute. In England and the U.S.A. where, of course, it was produced, it was principally employed for the manufacture of tyres and the majority of other rubber products. In this country, at least, however, it was never regarded as being as good as natural rubber and since this latter material has become available again, GR-S has disappeared from industry. The principal reason for this is that manufacturers did not want it in its old form for technical reasons. Some argued that they might like to use it for specific purposes but that it cannot be obtained because of the dollar shortage. This is not true to any appreciable extent since some synthetic rubbers which have inherent advantages over the natural product are imported from America at the present time and there is no reason why this should not apply to GR-S if it did have some advantages over natural rubber. GR-S is still being employed to a certain extent in the U.S.A. (round about 300,000 tons per annum are still being produced). This is due to a U.S. Government Order, making it essential to employ a certain percentage of the synthetic products. The reason for this is that it is desired to keep the synthetic rubber plants operating so that they can be quickly brought to full production capacity should the source of natural rubber be cut off once more. Another big reason is to keep down the price of the natural product since if this did become much higher than GR-S, the latter would be used in many instances at the expense of the natural product.

Thus it will be seen that GR-S is not wanted and is not being used in this country at the present time, although it is being employed to a certain extent in the U.S.A. However, it should be realised that extensive research is continually being carried out in the U.S.A. to develop a GR-S which will be as good and, if possible, better than the natural product, whilst maintaining it at the same price. In 1946 one company alone made 100,000 experimental polymers in their efforts to produce this improved product. There is no doubt that in due course a synthetic rubber with properties like the natural product will be evolved.

Other Synthetics.

When we come to consider other synthetic rubbers the position is entirely different. Many of these have certain properties which natural rubber does not possess. In view of this they are employed at the expense of the natural product. They are employed solely because of these inherent characteristics since in most cases their cost is higher than that of ordinary rubber. They are at present imported into this country and employed both here and in the U.S.A. on a fairly large scale. The most important are neoprene, butyl and perbunan synthetic rubbers. It would be best to consider their properties in a little more detail.

The neoprene and perbunan may be conveniently considered together. Their most important property is their oil resistance for which reason they are employed a great deal for the production of gaskets, oil resistant hose, parts of machinery where it is necessary to absorb vibration in the presence of oil and so on. They both also have the advantage of non-inflammability and this property, coupled

with their toughness, abrasion resistance and ozone resistance make them valuable for cable sheathings and like applications. These two synthetic rubbers therefore continue to be used and this is likely to continue.

Butyl rubber on a large scale is more recent than the other two but is being used extensively in the U.S.A. One of the most valuable properties is its impermeability to gases and for this purposes it has been employed a great deal for inner tubes for car tyres. Butyl rubber also has excellent electrical properties and very high resistance to ozone. It is therefore likely to be employed a great deal in the manufacture of cables, particularly in view of its water and chemical resistance generally. This latter property also applies to the other synthetic rubbers mentioned.

Other types of synthetic

In addition to the above synthetic rubbers, there are many others which at the moment are much less important. These include silicones, polyester types, acrylate types, thiokols, polymethylpentadiene and many others which have hardly emerged from the experimental stage. They each have some valuable property which the others and natural rubber do not possess and are made because of this alone.

A few examples of the uses of these synthetics will show how important they are. Neoprene for conveyor belts, printers' rollers and plates, aprons, hoods, boots and vibration mountings, apart from the applications already described. Neoprene (and to a certain extent perbunan) had become a standard engineering material for use under arduous conditions. Many uses of Butyl have already been mentioned and there are many others involving the use of its valuable characteristic of chemical resistance as evidenced by its resistance to nitric and concentrated sulphuric acid. The thiokols are particularly resistant to all types of solvents and the resistance of the silicones to heat is most pronounced. They will stand temperatures up to 300° deg. C. and can be worked continuously at 200° deg. C. For this reason they have been employed as searchlight gaskets and similar objects.

Thus it will be seen that the synthetics are an important contribution to our economy and they absorb scarce dollars. One may therefore enquire "why not make them in England?" The reason is that the raw materials are either non-existent or cannot be spared. For instance, the synthetics are made from natural gas, petroleum or alcohol which cannot be spared in England. Coal could be employed but it cannot be spared.

The truth about synthetic rubbers, therefore, is that they are extremely useful and have valuable properties of their own which we must utilise. With the exception of GR-S, the general purpose synthetic, therefore, the synthetic rubbers will continue to be used.

NEW OIL SEALS FEATURE SIMPLICITY WITH LOW COST

A new oil seal embodying all the best features of modern fluid sealing practice combined with simplicity of manufacture has been designed by P. R. Hallam, of 37, Nailcote Avenue, Coventry, and covered by Patent No. 574534.

The outer casing of the new seal is a ring cut from metal or plastic tubing, and to this is bonded a synthetic rubber sealing member. A coil spring can be fitted when high pressure sealing is required. The outer casing may also be of a special dense synthetic rubber which permits of greater bore tolerances and greatly facilitates installation and removal of the seals.

When it is realised that the usual practice in oil seal manufacture is to fabricate the metal parts from flat strip, involving a great number of machining operations, the advantages claimed for this new design seem justified.

We are given to understand that an external type of seal will also be available.

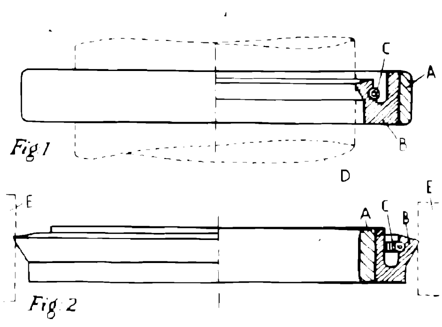


Fig. 1. The new oil seal.
Fig. 2. External type seal.

A. Metal, plastic, or dense synthetic tubing.
B. Synthetic rubber sealing member.
C. Coil spring D. Shaft E. Housing.

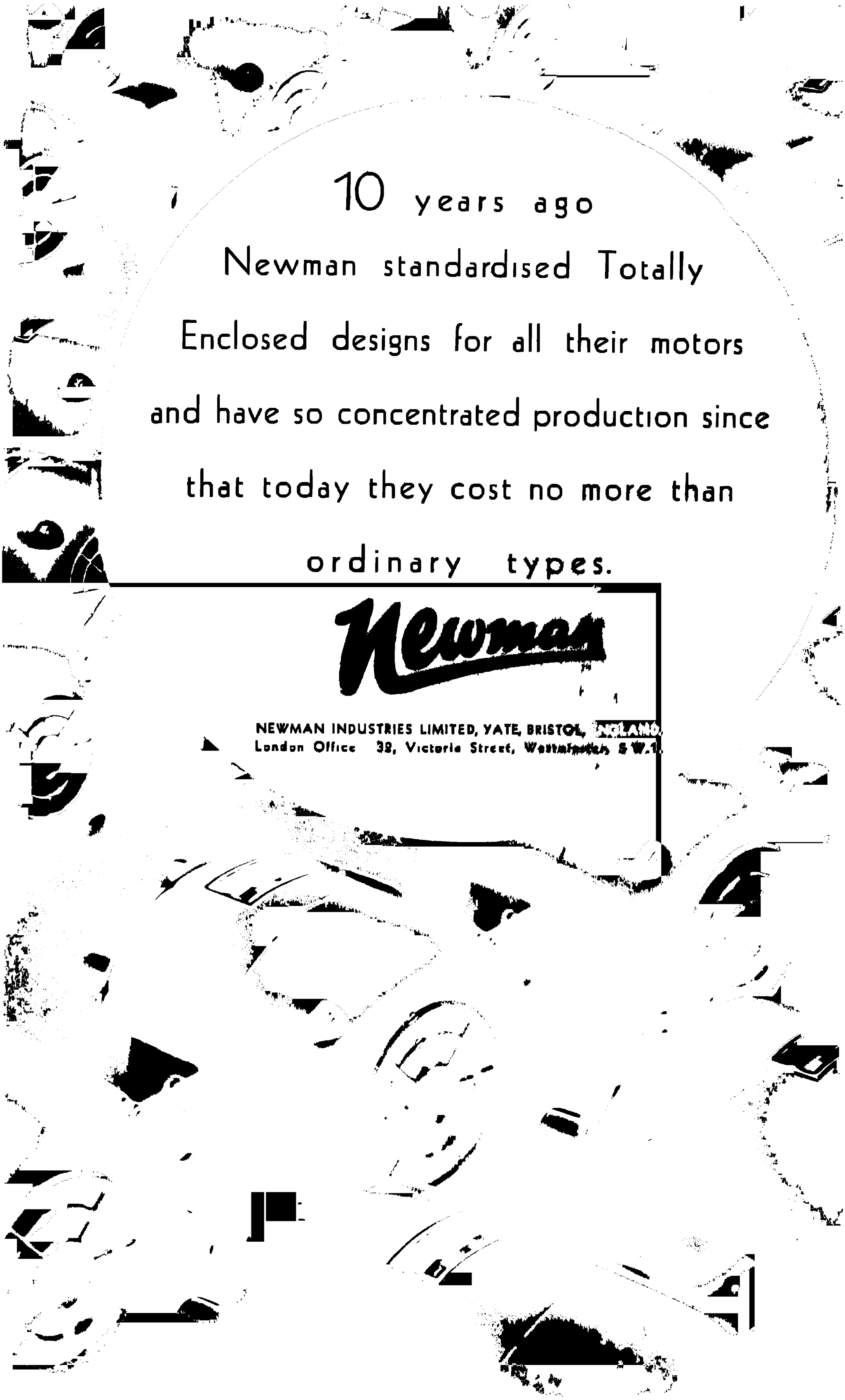
Forthcoming

M.O.S. AUCTION SALES

Date.	*Site of Sale.*	*Auctioneer.*
	Miscellaneous Stores.	
Feb. 10th to Feb. 12th.	M.O.S. Depot 113, Bordon, Hants.	Goddard & Smith, 22, King Street, St. James, S.W.1. Tel.: WHI. 2721.
Feb. 12th & Feb. 13th.	Simplex Electric Co., Grindley Lane, Blythe Bridge, Stoke-on-Trent.	Louis Taylor & Sons, Auction Chambers, Perry Street, Hanley, Staffs. Tel.: Stoke-on-T. 2373/4.
Feb. 17th to Feb. 20th.	M.O.S. Depot 103, King's Newton, Nr. Melbourne.	W. S. Bagshaw & Son, High Street, Uttoxeter. Tel.: Uttoxeter 265.
Feb. 17th to Feb. 20th.	M.O.S. Depot 55, Junction Road, Weston-super-Mare.	Percy Palmer, 3, Magdala Buildings, Weston-super-Mare. Tel.: 2451/2.
Feb. 24th to Feb. 27th.	M.O.S. Depot 98, Tower Bridge Road, S.E.1.	Fuller, Horsey, Son & Cassell, 10, Billeter Street, E.C.3. Tel.: Royal 4861.
Feb. 24th to Feb. 27th.	M.O.S. Depot 46, Cornholme Mills, Nr. Todmorden, Yorks.	Salisbury & Hamer, 50, Ainsworth Street, Blackburn. Tel.: 5051.
Feb. 26th.	M.O.S. Depot 156, R.N. Depot, Topsham Road, Exeter.	Rippon, Boswell & Co., 8, Queen Street, Exeter. Tel.: 3204.
	Vehicles, etc.	
Feb. 23rd to Feb. 25th.	M.O.S. Depot, Elstow, Nr. Bedford.	W. & H. Peacock, 10, Lime Street, Bedford. Tel.: 3115.
	Radio and Photographic Equipment.	
Feb. 18th.	Admiralty Storage Depot, Risley, Nr. Warrington.	Outhwaite & Litherland, 3, Eberle Street, Liverpool. Tel.: Liverpool CEN. 6561.
	Miscellaneous Radio and Electrical Equipment.	
Feb. 4th & Feb. 5th.	R.A.F. M.U. No. 35 Sub-site, Bowlee, Nr. Manchester.	C. W. Provis & Sons, 2, Booth Street, Manchester, 2. Tel.: CEN. 2800.
Feb. 26th & Feb. 27th.	R.A.F. M.U. No. 25, Hartlebury, Kidderminster.	Nock & Joseland, Bank Building, Kidderminster. Tel.: 2053.
	Miscellaneous R.A.F. Stores and Equipment.	
Feb. 9th to Feb. 11th.	R.A.F. M.U. No. 255 Sub-site, Balderton, Nr. Newark.	Escritt & Barrell, Elmer House, Grantham. Tel.: 1035/6.
Feb. 9th to Feb. 13th.	R.A.F. M.U. No. 261, Morpeth, Northumberland.	G. H. Storey, Sons & Parker, Higham House, New Bridge Street, Newcastle-on-Tyne. Tel.: 26291.
Feb. 10th & Feb. 11th.	R.A.F. M.U. No. 216, Sutton Coldfield, Nr. Birmingham.	A. W. Smallwood, Floyd & Jones, 23, Colmore Row, Birmingham. Tel.: Colmore 4243.
Feb. 10th to Feb. 12th.	R.A.F. M.U. No. 14, Carlisle.	Harrison & Hetherington Ltd., Botchergate, Carlisle. Tel.: 1792.
Feb. 11th.	R.A.F. M.U. No. 16, Sandon Road, Stafford.	South & Stubbs, Bank Passage, Stafford. Tel.: Stafford 82.
Feb. 17th & Feb. 18th.	R.A.F. M.U. No. 260, Errol, Perth.	Hay & Co., Perthshire Stock Mart. Tel.: Perth 317.
Feb. 17th to Feb. 20th.	R.A.F. M.U. No. 259, Peterborough, Northampton.	Fox & Vergette, Priestgate, Peterborough. Tel.: 4261.
Feb. 18th & Feb. 19th.	R.A.F. M.U. No. 90, Warton, Lancs.	E. G. Hothersall & Sons Ltd., Auction Mart, Preston. Tel.: 7218.

Although it is anticipated that these sales will take place on the dates shown, they should be taken as *tentative*, but the change of dates, if any, will only be a few days.

Lists of the type of stores to be included in the sales are not yet available, in the majority of cases they will be of a miscellaneous character: Electrical, Mechanical Plant and Equipment and Textiles, at each sale.


10 years ago
Newman standardised Totally
Enclosed designs for all their motors
and have so concentrated production since
that today they cost no more than
ordinary types.
Newman
NEWMAN INDUSTRIES LIMITED, YATE, BRISTOL, ENGLAND.
London Office 32, Victoria Street, Westminster, S.W.1.

AMERICAN DIGEST

Bringing news of the latest developments from the U.S.A.

Quick Seasoning of Wood. By using a vapour method, an American company has reduced the moisture content of railway sleepers from 80% to 30% in 12 hours. The wood is raised to a high temperature in a chamber and is protected against charring by an inert organic vapour such as xylene or high flash-point naptha. The moisture contained in the timber is withdrawn with the organic liquid and the latter is recovered by distillation, whilst the last traces of the organic substance are removed by means of a vacuum drying oven. Besides being quicker than kiln drying the new method will remove resins which sometimes cause trouble when the wood is painted.

Underfloor Shafting. It is claimed from U.S. experiments that the maintenance cost of machine shop shafting is reduced when the shaftes are put in trenches under the floor. Belt guards and inspection covers provide no difficulties.

Paint to Match any Colour from 8 Basic Constituents. A paint to match any existing colour can be produced within a few minutes with a simple system called Nu-Hue and which has been developed by the Martin-Semour Co. in America.

The colour required is first found in a set of 1,000 colour samples mounted on cards. When the correct sample is found the back of the card gives a proportional formula using the 8 basic tones, yellow, red, orange, purple, blue, green, grey and white. It is then only necessary to mix the required number of parts of each colour. The cost of paints thus mixed to order is said to be close to that of ready mixed standard paints.

Heat Resisting Resin. Tetrafluoroethylene resin ("Teflon") was developed during the war by the U.S. company du Pont de Nemours and it is claimed that it retains its form and strength at a higher temperature than any other known organic material. The upper limit is 572° F. and the resin has satisfactory properties down to —75° F.

Its resistance to chemicals is very good and amongst those which do not affect it are, hot sulphuric acid, aqua regia, boron trifluoride, hot nitric acid and boiling sodium hydroxide.

Plastics-and-Glass Jig. An interesting example of how plastics can be used to good advantage, providing that the older methods are put out of mind, comes from an American aircraft plant. The subject was a drilling jig used in wing production and it had to guarantee the accurate positioning of 86 holes. For various reasons an all-metal jig was ruled out as undesirable and an attempt was made to fabricate one from new materials.

Firstly, a 0.064 inch steel template was bent to the desired contour and was fitted with steel locating pins. An inch of plaster was poured around the pins to hold them firmly in place and was sealed with five coats of cellulose lacquer. Hexagonal bushings with undercut collars were also set over the pins.

Then nineteen layers of glass fabric, bonded with phenolic thermosetting resin, were built up around the bushings. Glass-fibre tape, half an inch wide, was laid along and between the bushings to ensure good bonding. The whole assembly was then cured for 96 hours at 180° F. to set and dry the resin and to prevent after-shrinkage.

Lastly the template was removed, the locating pins knocked out, the plaster knocked off and the jig mounted. Its final structure was 32 per cent. (by weight) of glass fabric and 68 per cent. plastic, with a thermal expansion coefficient about equal to that of aluminium.

Low Melting Point Moulding Material. A new low melting-point alloy for use as a moulding material has been introduced by Trethway Associates in the U.S.A. It is called "Moldaloy," and has characteristics as follows.

Melting Point ...	430 deg. F.
Hardness	22 BHN.
Compression Strength	8,000 lb./sq. in.
Tensile Strength ...	11,500 lb./sq. in.
Shrinkage	0.001 in./in.

The material is suitable for moulds for casting low-temperature-fusing plastics, rubber moulds, wax moulds for precision casting, process moulds for engraving machines, master patterns, forming dies for thin metal sheets and thermal plastics, chuck jaws for holding irregular shape pieces and as a protective coating on wood patterns.

PERSONALITIES

Geoffrey A. St. C. Emery has relinquished his appointment as Chief Technical Officer of Miles Aircraft Ltd. and has been appointed Chief Engineer of Philidas Ltd., the manufacurers of the well known Self-Locking Nut.

Mr. T. S. G. Roberts has joined the research and development department of the British Oxygen Co. Ltd.

Mr. Rawson F. Stagg has been appointed Assistant Managing Director of Ketton Portland Cement Co. Limited.

Mr. E. S. McCallister, who for many years has been connected with the electrical industry, particularly with the development of electronic instruments, has been appointed to the electro-medical department of Philips Electrical Ltd., Century House, Shaftesbury Avenue, London, W.C.2.

Dr. F. Alan Todd has joined Genatosan Ltd. as Production Manager.

Mr. Hartland Thomas M.A., F.R.I.B.A., M.S.I.A. has joined the Council of Industrial Design to take charge of its Industrial Section which is directly concerned with offering a practical service to industry on design problems, and particularly with helping industries to set up their own Design Centres.

Mr. A. T. Green has been appointed Hon. General Secretary of the British Ceramic Society. He succeeds the late **Dr. J. W. Mellor**.

OBITUARY

It is with deep regret that we have to report the death of **Mr. C. H. Foyle,** Founder and Chairman of Boxfoldia Ltd. For the last three years, Mr. Foyle has not been able to participate actively in the management of the Company but, in addition to directing policy, he has maintained the keenest interest not only in the organisation of production but also in social development within the business, and in the work of the Charles Henry Foyle Educational Trust which he established in 1940 by transfer of half of his Ordinary Shareholding in the Company.


Mr. C. H. Foyle

Leyland Motors Ltd. has appointed **Mr. C. J. Jeffery** as the company's Employment Manager at the headquarters factories of Leyland and Farington. His duties will include all problems of engagement and employment as well as the control of the works' Welfare and Security organisations. He will also assist the company's Branch Works Managers in an advisory capacity.

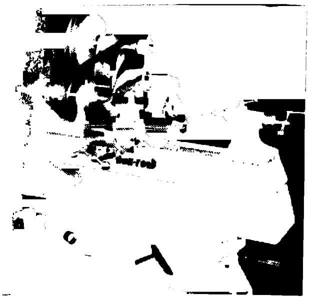

Mr. C. J. Jeffery

Mr. Christopher Leonard Gale Fairfield, M.A., A.M.I.E.E., A.M.I.Mech.E., Barrister at Law, has joined the Mullard Wireless Service Company Ltd. The applications of Mullard research and development work to industrial problems will be one of his many activities, in which he will act as assistant to the directors of the Company in a technical capacity. Mr. Fairfield comes direct to Mullard from Balfour Beattie Ltd., where he held a similar post.

E. H. Jones (Machine Tools) Ltd., Edgware Road, The Hyde, London, N.W.9., advise us that **Mr. E. Aron,** Managing Director of C.V.A. Jigs, Moulds & Tools Ltd., of Hove, has now been appointed managing director of this company. **Mr. E. J. M. Jones** being deputy managing director.

Mr. J. M. Surrall, General Commercial Manager, has been appointed a Director of the T.I. subsidiary company, Simplex Electric Company Ltd., of Oldbury, Birmingham.

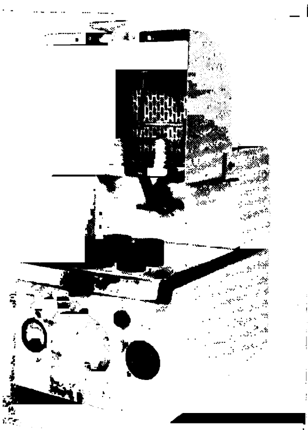
Review of EQUIPMENT



Bench Lathe

We show above the "Boxford" 3″ bench type precision lathe. Powered by a $\frac{1}{4}$ h.p. motor it has 8 speeds from 170 to 1210 r.p.m., admits $9\frac{1}{4}$″ between centres and has capacity for $3\frac{1}{2}$″ swing over the saddle. A descriptive leaflet is available from the makers.

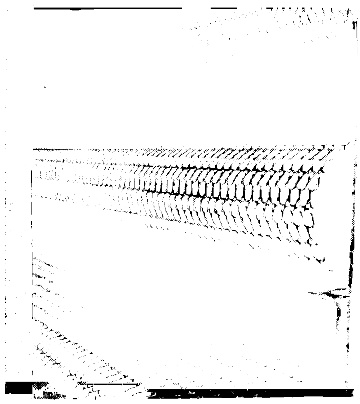
Supplier:—**Denfords Engineering Co., Ltd.,** Box Trees Mill, Wheatley, Halifax.



Radio Heater

Here is a very compact table radio heater which is ideal not only for the pre-heating of plastic moulding powder but also the rapid re-heating and cooking of certain foodstuffs. It is only necessary to close the oven lid in order to start the heating process, the duration of which is pre-selected on an automatic full vision process tuner. At the end of the heating cycle the oven lid opens automatically.

Supplier :—**Radio Heaters,** Wokingham, Berks.



Wire Belting

"Wedco" Woven Wire Conveyor Belts are used for Mechanical Handling Equipment in washers, coolers and dryers of the air circulation or infra-red type. They can be made in any length desired, without visible joint, and in special materials resistant to water, acid or heat up to 1150 deg. C. This photograph shows a typical application.

Supplier :—**The British Wedge Wire Co. Ltd.,** Academy Street, Warrington, Lancs.

Drill Guard

This is a novel type of guard for drills or similar machines. Being made of Perspex and hinged to open, it provides visibility with perfect safety and accessibility.

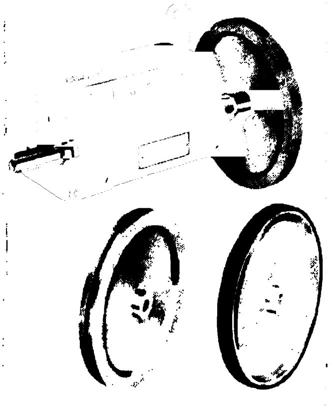
Supplier :—**Air Ducts Ltd.,** Great West Road, Brentford, Middlesex.

Standard Half-bearing

The Glacier Metal Company Ltd., have introduced a range of bearings with standard outside diameters. The designer selecting from this range is required merely to size his housing bores to suit. Bearing length and features such as oil holes, grooves, gutterways, position of locating lugs, etc., can be as desired. Within limits he can also specify wall thickness.

Supplier :—**Glacier Metal Co. Ltd.,** Alperton, Wembley Middlesex.

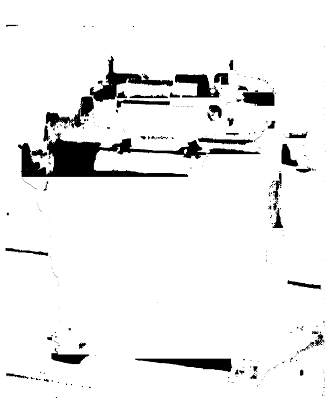
Review of EQUIPMENT



Counting Machine

This counter is of robust 5 figure reset construction, capable of recording at speeds up to 6,000 r.p.m. Frictional wheels having synthetic rubber, plain or knurled metal peripheries are offered, and for the measurement of thread, wire, twine, etc., varying "U" or "V" grooved wheels can be furnished.

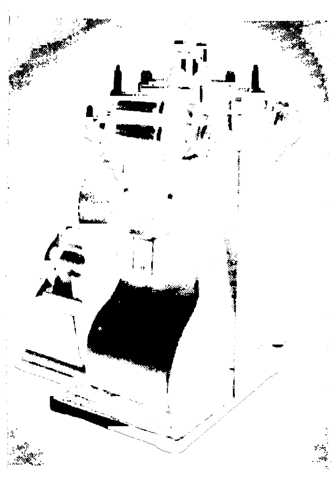
Supplier :—**English Numbering Machines Ltd.,** 38, Barrett's Grove, London.



Automatic Dowel Rounding Machine

This small, automatic machine has a universal 4 bladed cutter head which will take in all sizes from ⅜"—1" without changing the cutters. The electric motors are housed inside the pillar and the push button starters are seen within easy access of the operator. To get the necessary high cutter head speed the drive is by endless V belts and one pair of feeding and two pairs of withdrawing rollers are provided. The makers can also fit as a separate attachment a tool to cut the spiral grooves round the dowels so extensively used in furniture manufacture.

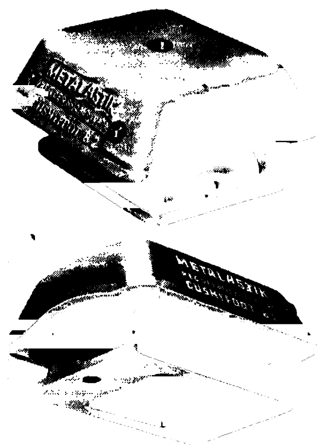
Supplier :—**W. A. Fell, Ltd.,** Bridge Iron Works, Windermere.



Dieing Machine

This new British C.V.A. dieing press produces accurate parts at 300 per minute in one operation, rendering several orthodox press settings unnecessary and cutting costs both on production and maintenance.

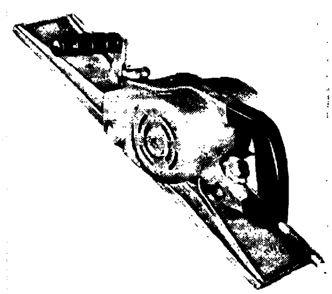
Supplier :—**E. H. Jones (Machine Tools) Ltd.,** Edgeware Road, The Hyde, London, N.W.9.



Anti-Vibration Mounting

A new machine "foot" by Metalastik incorporates bonded rubber absorbing pads sandwiched between metal top and base fittings. A special leaflet is available from the supplier.

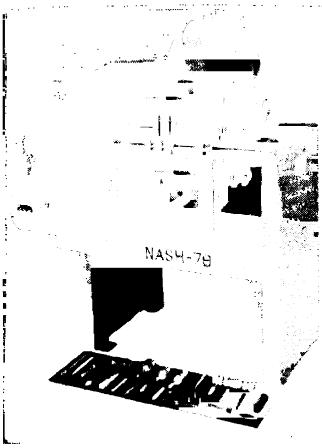
Supplier :—**Metalastik Ltd.,** Evington Valley Road, Leicester.



Electric Plane

The Tarplaner has many advantages over the fixed bench plane. It is cheaper. It is portable and can be used anywhere where there is an electric supply.

Supplier :—**Tarpen Engineering Co.,** Ixworth House, Ixworth Place, London, S.W.3.



Automatic Sander

The No. 79 Automatic Turning Sander is designed for the production sanding of small turnings up to 2″ in diameter and 8″ in length. This machine will automatically sand various types of turned tool handles, kitchen utensil handles, spools, bobbins, fishing baits, knobs and similar small turnings of this nature.

Supplier :—**Gaston E. Marbaix Ltd.,** Devonshire House, Vicarage Crescent, London, S.W.11.

Tool Box

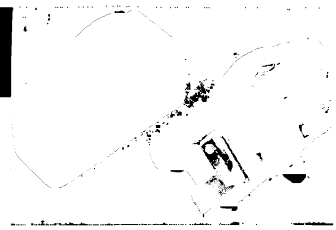
The essential feature of this latest tool is that it renders tool setting easy and simple so that female employees can set up their own work or make adjustments without assistance. With normal pattern box tools, setting up is a skilled job if the work produced is to be accurate. Shown here is the new model with a tangent tool post.

Supplier :—**The Saunders Tool Co.,** 7, Brokengate Lane, Denham, Bucks.

Power Press

This is the first post-war Humphris press. It has a variable stroke of up to 2″ and a separate ram adjustment of 1½″. The Press is self-contained and motorised. It is fitted with the Uda 1 Interlock Guard, a feature being that the foot pedal can be fully depressed with the guard open and without operating the clutch. The clutch only operates when the guard is fully closed.

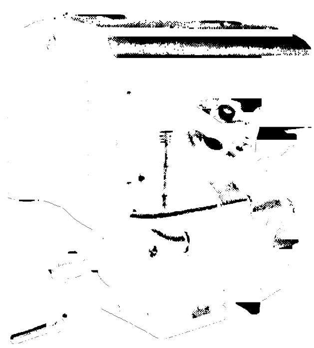
Supplier :—**Humphris and Sons Ltd.,** Park Road, Parkstone, Dorset.



Circuit Breaker

The "Klipin" circuit breaker shown above has been designed to meet the demand for a simple, small and reliable circuit breaker for the protection of small motor appliances, electric tools, lighting circuits, etc., particularly where the initial starting current is greater than the normal running current.

Supplier :—**A.E.W. Ltd.,** Edgware, Middlesex.



Diesel Engines

This new Turner all-weather engine is fitted with a 3 : 1 reduction gear in the flywheel which means that the overall engine length is unaffected.

Supplier :—**Turner Manufacturing Co. Ltd.,** Wulfruna Works, Villiers Street, Wolverhampton.

Review of EQUIPMENT

Small Grinder

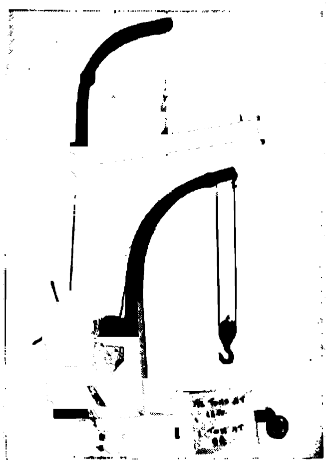
Supplied with a floor stand or for bench mounting, this Merlin Grinder is only 33″ long x 21″ wide. It is equipped with built-in ½ h.p. electric motor, variable speed control, flexible drive from motor, swivelling head, full adjustment arrangements, taper grinding index and necessary locks and controls.

Supplier :—**Merlin Engineering Co. Ltd.,** Hebble Mills, Salterhebble, Halifax, Yorkshire.

Testing Machine

This machine provides an accurate yet rapid means of checking all dimensions upon which the performance and interchangeability of a worm depends, and for testing finished wheels in conjunction with a master worm, thus providing a rapid check to be made on the accuracy of the tooth contact. The machine checks : Concentricity of the worm, thickness of worm thread, pressure angle of worm thread, pitch and indexing of worm threads, thickness of worm wheel teeth and contact area on the worm wheel teeth.

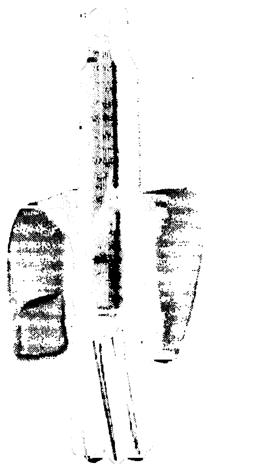
Supplier :—**David Brown Tool Company,** Park Works, Huddersfield.



Portable Cranes

The two cranes shown above are examples of cranes specially built for their job. In general, this type of crane can be designed to handle loads from 3-cwts up to 3 tons at a maximum outreach of approx. 3′ 6″. Heights of lift can be from 5′ up to 25′ according to the work they are called upon to do. Costs vary, the smaller machine in the photograph was produced for £87 10s. 0d. The larger machine for £105. It is not possible to give standard specifications because of the widely different types of jobs these machines have to do. In every case a survey is made of the site, and a machine designed accordingly.

Supplier :—**J. Langley, 41,** Cranley Road, Ilford, Essex.



Plastic Packing

With the introduction of their " Safepak " the Birmingham Tool & Gauge Co. Ltd., has taken a great step towards overcoming the risk of damage to which precision parts are subject during transit. Such products as milling cutters, reamers, form tools, boring bars, toolholders etc., which the Birmingham Tool & Gauge Co., Ltd., manufactures, will in future be coated with " Safepak" before being despatched to customers.

Details from:—**Birmingham Tool & Gauge Co. Ltd.** Soho Hill, Handsworth, Birmingham 19.

A LETTER FROM OUR POST-BAG

To the Editor of " Mass Production."

Sir,

It becomes increasingly apparent that, if Britain is to bridge the gap between imports and exports and increase her overseas sales she will need to muster to the full all her selling resources.

There are all over the world to-day several thousands of Britains occupying important administrative positions in Government and business offices. Each and every one of them —and their families as well—can be salesmen for Britain.

Far too many of them, as I know from personal experience, can still be seen driving about in foreign cars. Is this quite fair when they are dependent, in the ultimate issue, on the sound economy and prosperity of their home land ?

This applies not only to private individuals but particularly to Government officials. Their remuneration comes out of the pockets of British tax payers and it is a poor form of loyalty to the home country for them to be, in fact, advertisers of competitive products.

It always has been hard for me to understand why Governments of the past as well as that of the present have not taken steps to remedy this state of affairs.

What can a foreign national think when he sees Britishers—especially those engaged in Government duties—supporting a foreign manufacturer ? What does the visiting Britisher think with the picture, fresh in his mind, of the great export drive at home, and the austerity which is its counterpart ?

A trader in Johannesburg recently remarked " If Britons in this City would only support British industry I estimate that, in my particular line, sales of British goods would go up by at least 20%."

" Here is food for thought. Is it too much to ask the British Government, as well as British Firms with branches overseas, to insist that their personnel should " Buy British and be Proud of it."

I am, Sir,

Yours faithfully,

NUFFIELD.

Morris Motors Ltd.,
Cars Branch,
Cowley, Oxford.

MORE THAN 1,500 DIFFERENT TYPES

machine tools

AVAILABLE NOW!

Government Surplus machine tools available NOW at attractive prices. YOUR opportunity to get better equipment and increase production.

DISPOSAL CENTRES, *where records of all machines available may be inspected, are open to the public for enquiries from 10 a.m. to 4 p.m. Monday to Friday inclusive :—*

BIRMINGHAM
C.M.L. Buildings, Great Charles Street.

BRISTOL
8/9 Elmdale Road, Bristol 8.

CARDIFF
Imperial Buildings, Mount Stuart Square.

GLASGOW
21 Glassford Street.

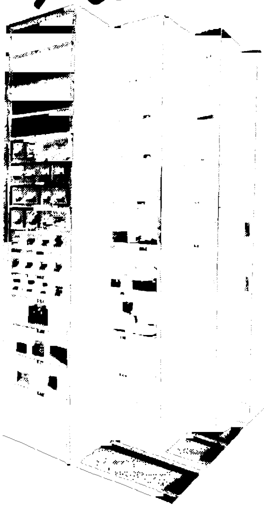
LEEDS
10 Bank Street, off Boar Lane.

LONDON
Room 0088, Ground Floor, Thames House North, Millbank, S.W.1.

MANCHESTER
Britannia House, Fountain Street.

ISSUED BY THE MINISTRY OF SUPPLY

Revolutionary



STORAGE SYSTEM

The 'brilliantly simple' principle of STORMOR Storage Equipment upsets all pre-conceived ideas as to what storage is possible within a given area. Applicable to a small office or the biggest works, this patented method utilises ***modern storage units which slide smoothly aside*** to give immediate access to similar units placed directly behind in ranks.

In other words, it almost completely does away with gangways between the ranks.

Send for illustrated explanatory Brochure now.

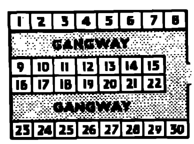


Fig. 1. A typical layout of the old system of fixed shelving which allows for 30 racks only.

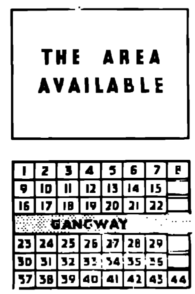
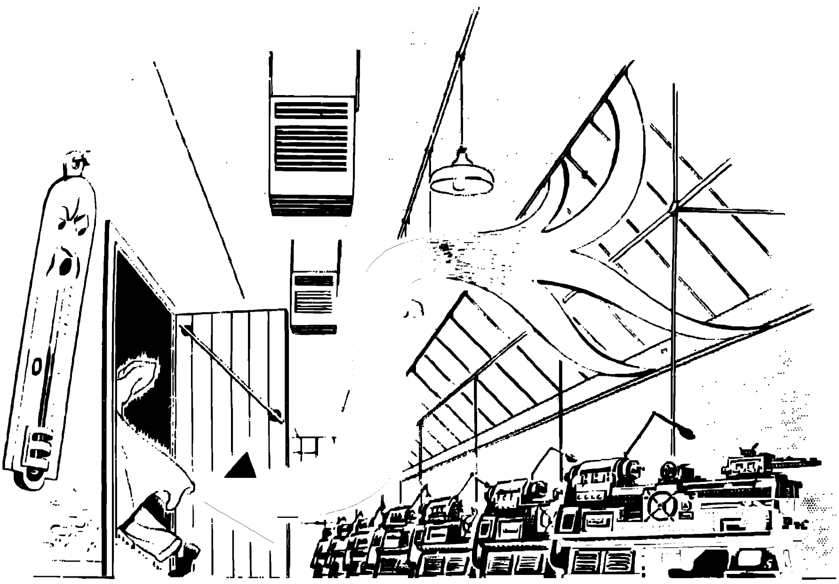


Fig. 2. See the difference when obsolete systems are replaced by STORMOR storage. Here 44 racks of the same size as above are accommodated in the same space, giving 47% more storage capacity

Stormor
STORAGE EQUIPMENT

J. GLOVER & SONS LTD
GROTON ROAD, LONDON, S.W.18
Telephone: BATtersea 6511-2



The warmth that went to dinner !

Scene—a machine shop of a light engineering works in the Midlands. The whistle blows for dinner—down tools—up jackets—doors are flung open and the rush to the canteen is on.

Back in the shop, doors are left open—temperature is dropping down—down—down. Warm—cheerless—COLD. In the stokehold extra firing strives to counteract the drop. Precious fuel goes to fight a battle that need never have been fought.

Action from the Works' live-wire Joint Fuel Efficiency Committee. All external doors to be fitted with air locks—light inner structures with sprung swing doors to be provided. Result: extra firing no longer necessary and the heat in the machine shop stays in to dinner !

This is a true story. Is there a lesson in it for *you ?* Are your factory doors self-closing ? Are broken windows patched up, if only temporarily, until proper repairs can be made ? *Are cracks and crevices in the building's structure tightly sealed ?*

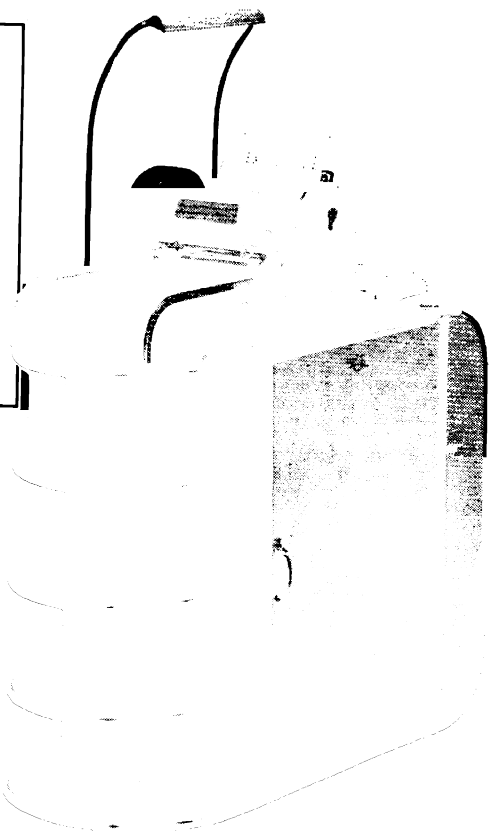
Are you keeping warmth IN by keeping draughts OUT ?

YOUR REGIONAL FUEL OFFICE

REGION	ADDRESS	TELEPHONE
Northern	Government Buildings, Ponteland Road, Newcastle-on-Tyne, 5	Newcastle 28131
North-Eastern	Century House, South Parade, Leeds, 1	Leeds 30611
North-Midland	Castle Gate House, Castle Gate, Nottingham	Nottingham 46216
Eastern	Shaftesbury Road, Brooklands Avenue, Cambridge	Cambridge 56268
London	Mill House, 87/89, Shaftesbury Avenue, W.1	Gerrard 9700
South-Eastern	95, High Street, Rochester	Chatham 3487
Southern	Whiteknights, Earley, Reading	Reading 61491
Wales	27, Newport Road, Cardiff	Cardiff 9234
South-Western	12/14, Apsley Road, Clifton, Bristol, 8	Bristol 38223
Midland	Temporary Office Buildings, Hagley Road West, Birmingham, 17	Bearwood 3071
North-Western	Burton Road, West Didsbury, Manchester, 20	Didsbury 5180-4
Scotland	145, St. Vincent Street, Glasgow, C.2	Glasgow City 7636
Scotland	51, Cockburn Street, Edinburgh, 1	Edinburgh 34881
Scotland	1, Overgate, Dundee	Dundee 2179

ISSUED BY THE MINISTRY OF FUEL AND POWER

New Wrinkle finished the job for Fordigraph



NEW WRINKLE speeds up Production — lowers Costs!

The value of a good finish for a good product is fully realised by Messrs. Frank R. Ford Limited of Birmingham, makers of the famous FORDIGRAPH Reproducing Machines. That is why NEW WRINKLE is the chosen finish for the Machine and Cabinet of their latest " Streamline " Model.

NEW WRINKLE is the truly superior one-coat finish. As the surface to be coated needs no preliminary primer, or special preparation, there is a considerable saving in material and labour costs, production is speeded up.

Any surface that can be stoved can be given enhanced sales appearance with the beautiful NEW WRINKLE finish. There is a full range of colours, and two textures to choose from ; in Black there are three textures.

WRITE TODAY FOR DETAILS.

PUT A NEW SELLING FACE ON YOUR PRODUCT

New Wrinkle THE ONE COAT FINISH

BRITISH PAINTS LIMITED, PORTLAND ROAD, NEWCASTLE UPON TYNE

Phone: Newcastle 25151

LONDON OFFICE: Royal Mail House, Leadenhall Street, E.C.3. Phone: MANsion House 8874

Sole Licensees in Great Britain, Northern Ireland, Eire, Australia, India, and British Possessions in Africa

What Thompsons do in Woodturnings is *everybody's* business

Believe it or not but this Spindle with three flanges of exact position and circumference, with four niches to each, is a wood turning. Wood proved to be ideal for the job, it being so very cheap. It is a turning by Thompsons of Crosshills—turners in wood with the precision standards of engineers.

W & J R THOMPSON (WOODTURNERS) LIMITED

Any turning in any wood to engineers' precision standards from blueprints, drawings or samples

CROSSHILLS KEIGHLEY YORKSHIRE

Phone: Crosshills 312-3 'Grams: Turnwood, Crosshills

There is perhaps no other type of chain with such universal uses as Ball Chain, noted for its strength and durability. It is unequalled for such purposes as the production of sanitary fittings, and widely used by the hardware, jewellery and electrical trades, to mention but a few. We have recently augmented our capacity to produce this type of chain, and can now give prompt delivery. At present we are manufacturing two sizes, No. 6 ([illegible]" dia.) and No. 10 ([illegible]" dia.).

BIRMINGHAM ASSOCIATED CHAIN CO. LTD. BIRMINGHAM

RP2082G

An instrument in the E.N.M. range will most probably solve your counting problem. Our technicians will gladly consult with you as to the most suitable and economic way to meet your requirements.

ENM

FOR THE RIGHT COUNT

ENGLISH NUMBERING MACHINES LTD

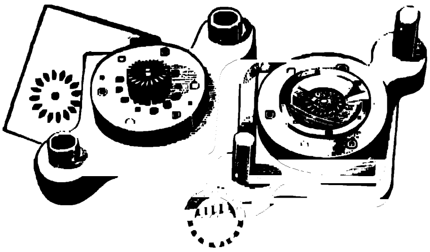
REVOLUTION COUNTER MODEL CW F

RATCHET COUNTER MODEL CR

PUMP COUNTER MODEL PC

1774

ENGLISH NUMBERING MACHINES LTD., 33, BARRETT'S GROVE, LONDON. N.16 PHONE: CLIssold 6882 (PBX)

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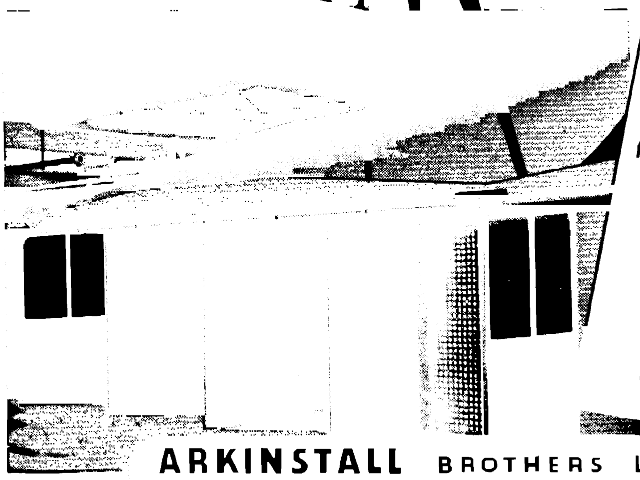

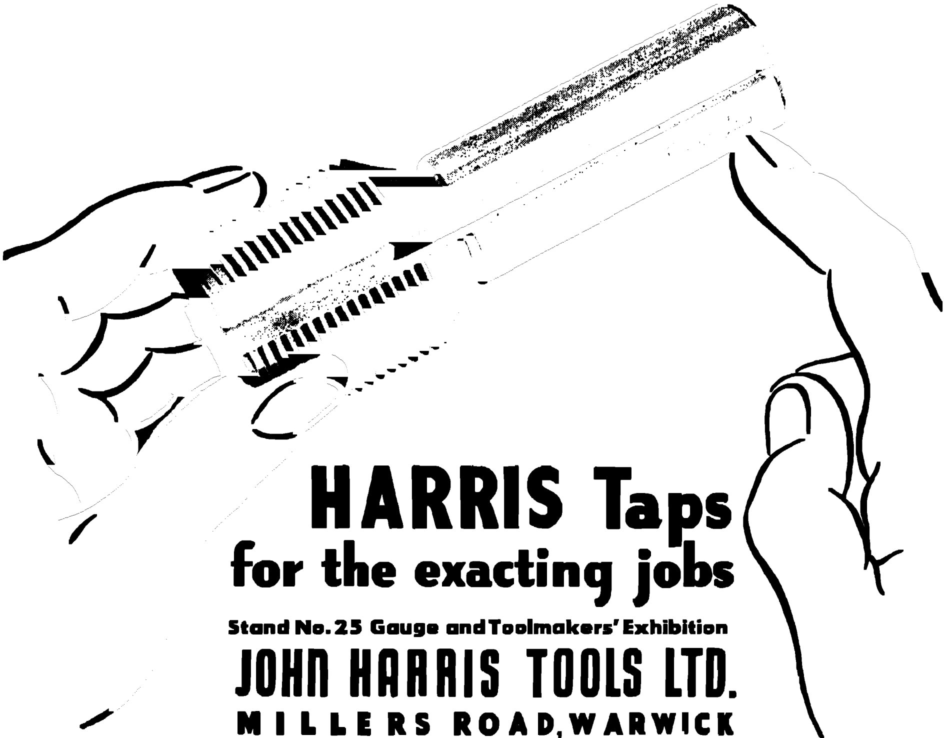


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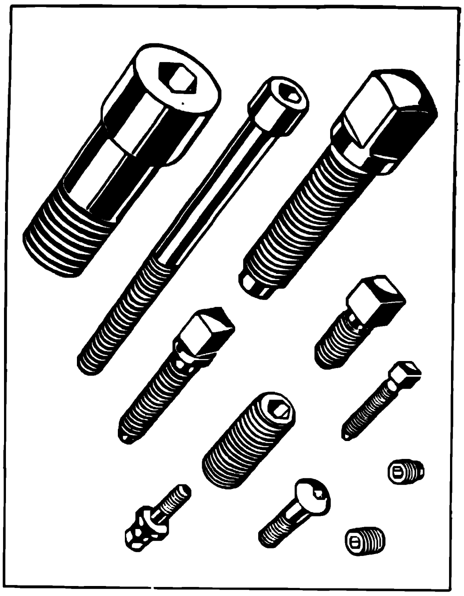

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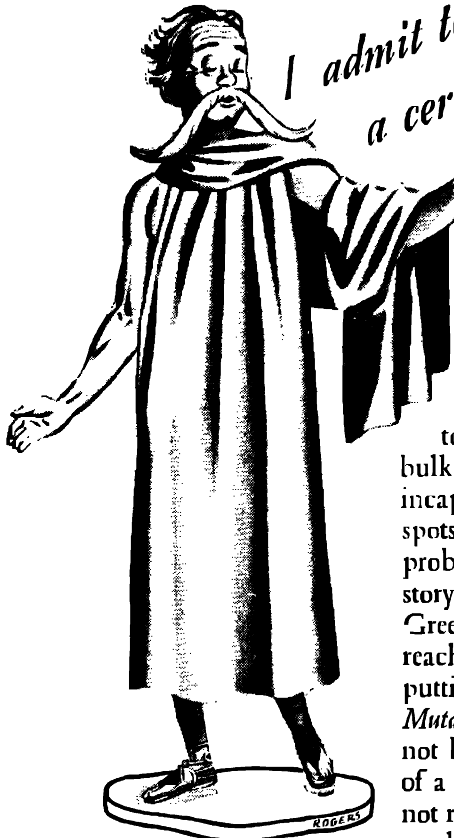

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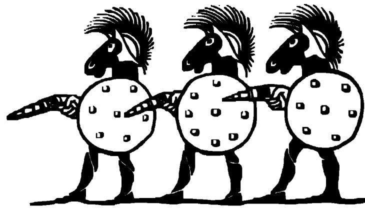

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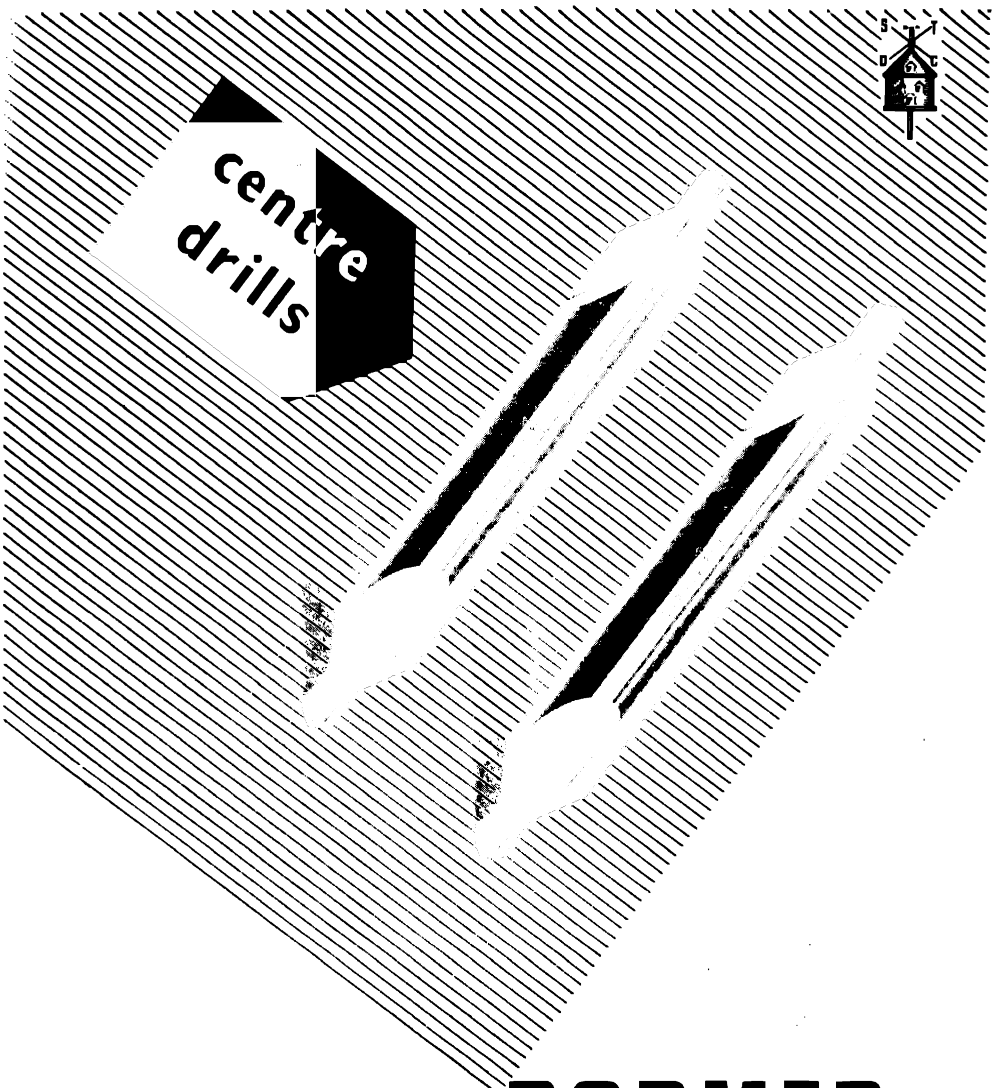

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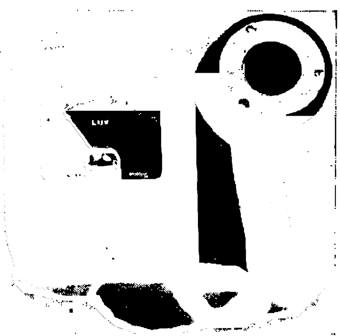

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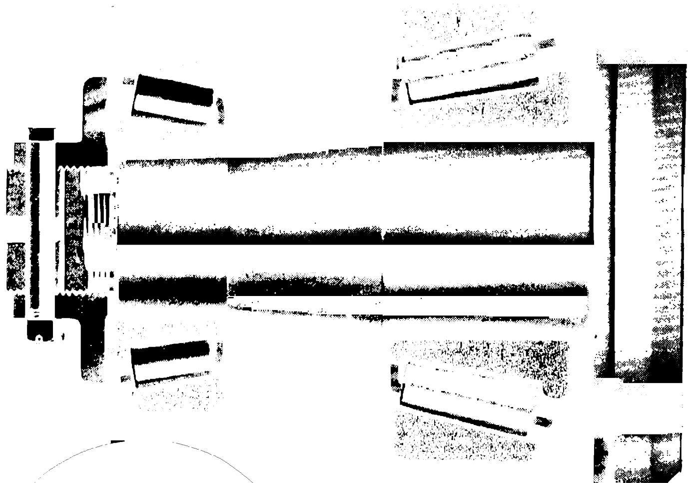

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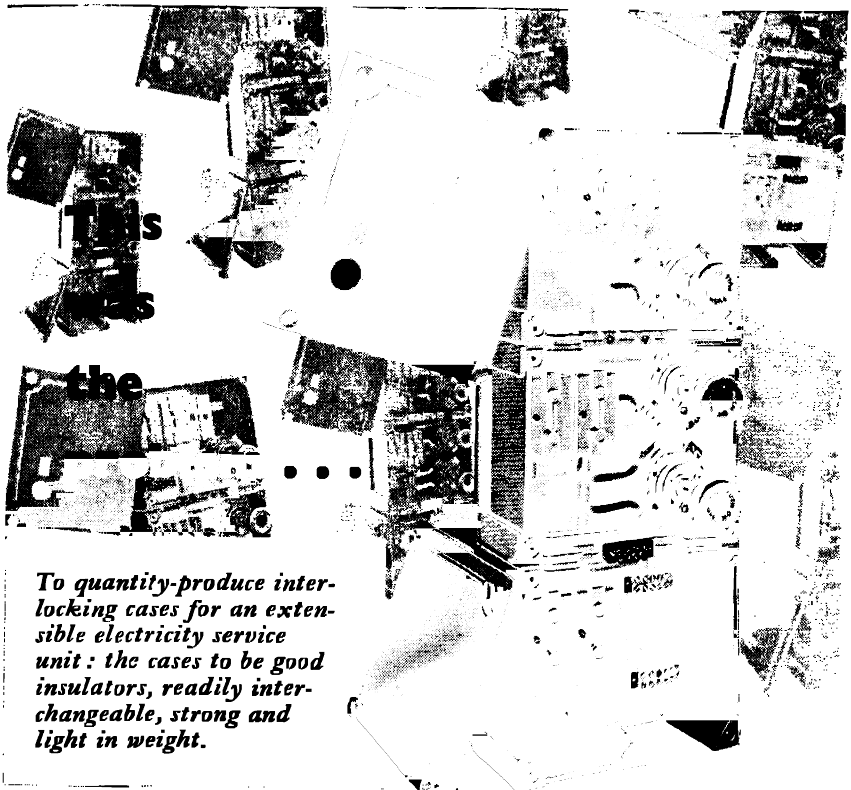

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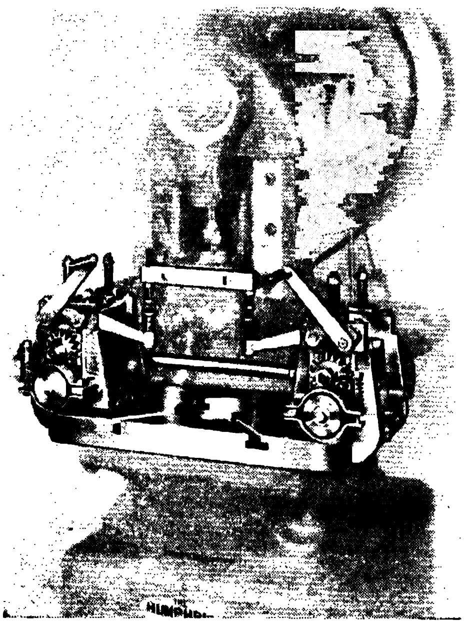
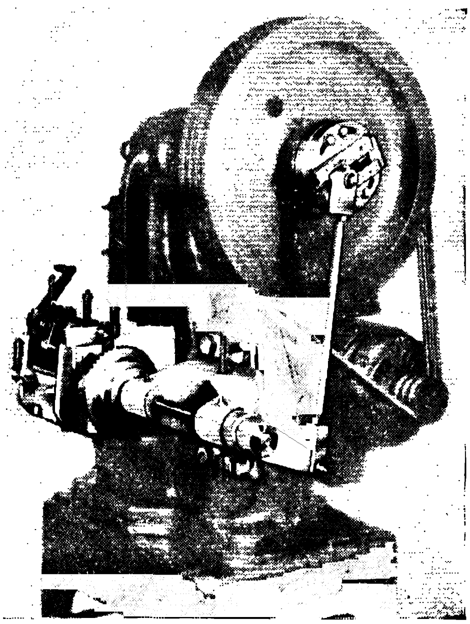


The Humphris Double Roll Feed on the Humphris Ten Ton O.C. Press. Supplied fitted complete to special interchangeable bolster plate. (Guards removed.)



Rear view, showing flywheel connection with calibrated adjustment. (Guards removed.)

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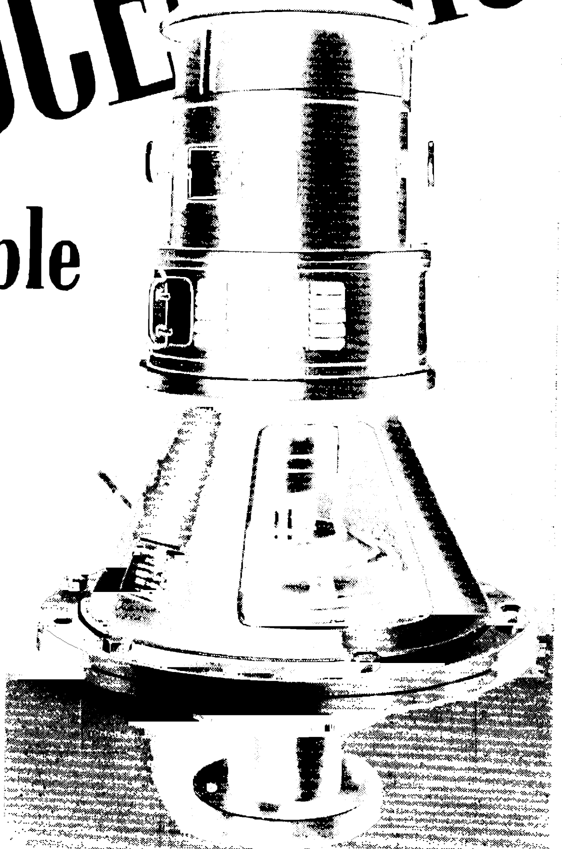

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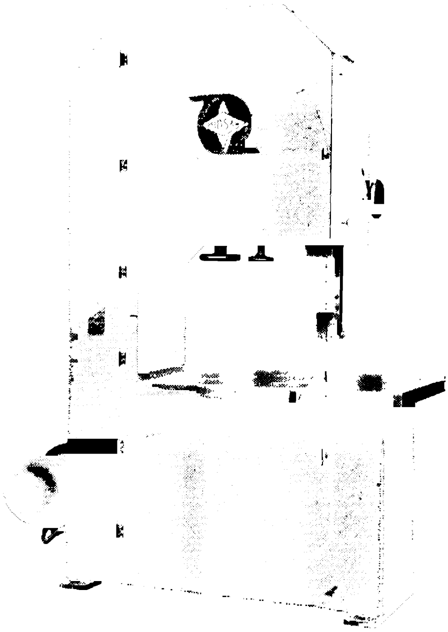

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180 . . . M.P.H.

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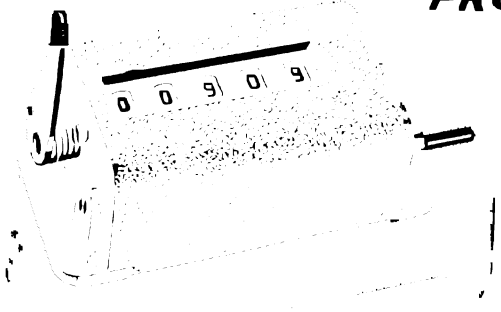

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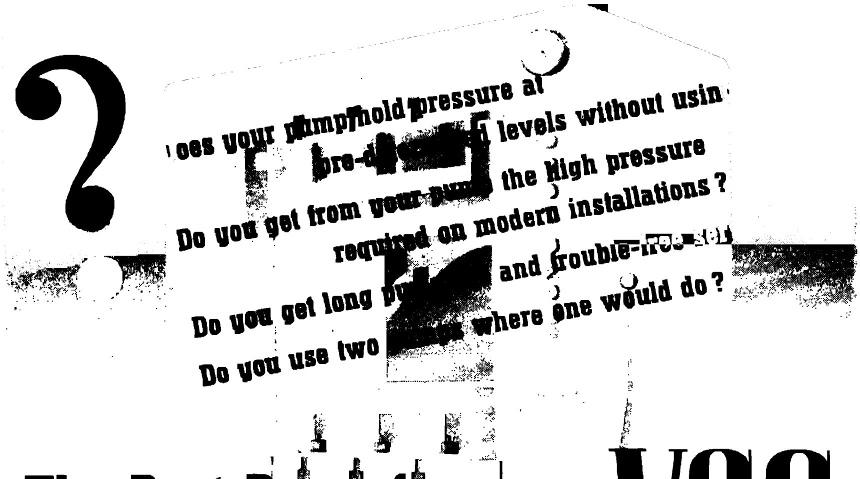

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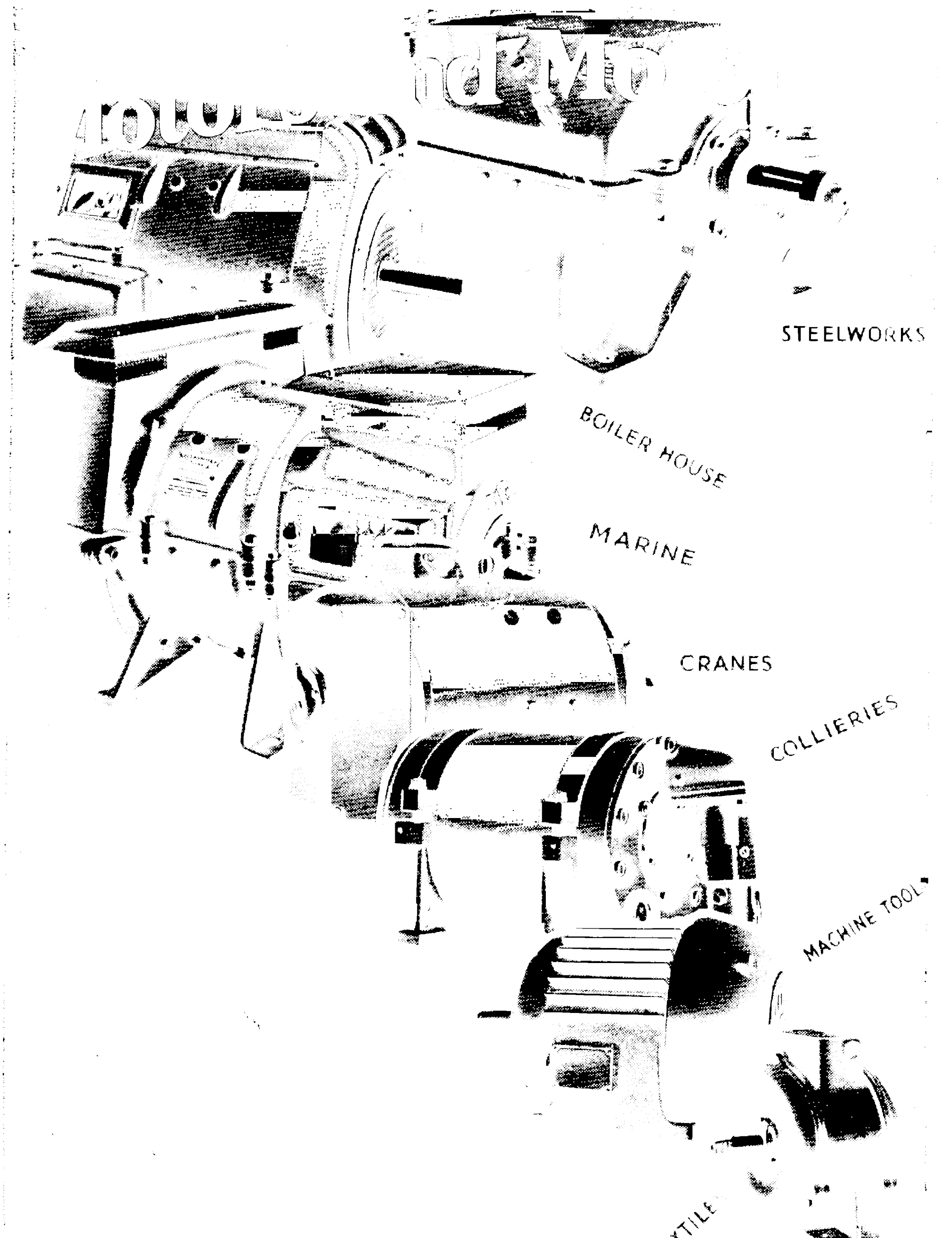
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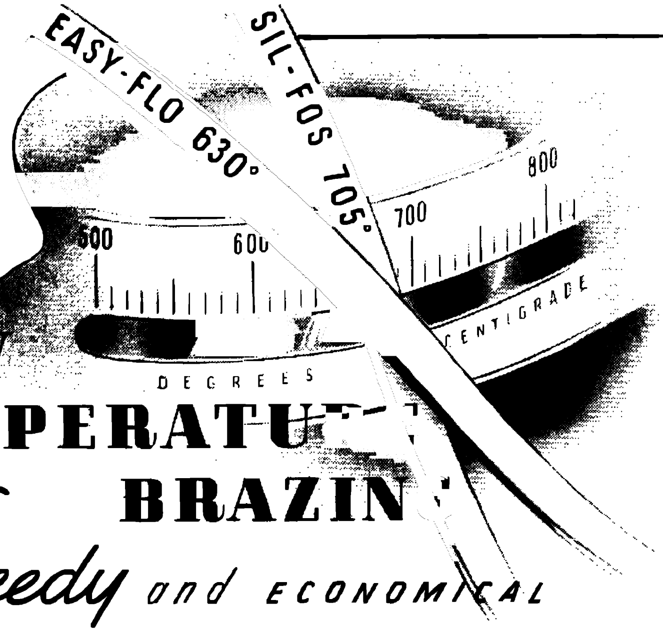

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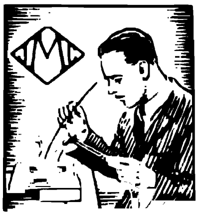

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TINKERING WITH THE TIN TRADE

Before the war, in 1938 and 1939, the price of tin was between £156 and £225 per ton. In November 1947 it stood at £437. As we go to press we note from our market correspondent (see p. 81) that it now stands at £519—well on the way to becoming a "precious metal." Small wonder that the tin-using industries are getting worried. Tin merchants are facing what they have dubbed "the Government's Tin Bloomer." As cooking and similar utensils contain between 30% and 80% of tin and hundreds of industries use it for products as well as for containers, this bloomer may boomerang right into our homes and factories.

To appreciate the motive-power behind the boomerang, we have to try and fathom the intricacies of an international tin deal—to which Britain is party—that might well have been negotiated by the script-writers for the Crazy Gang. It is as full of baffling complications as Hampton Court's great maze. Bare bones of the tin muddle are as follows: The world's tin supply comes mainly from British, Bolivian, Belgian and Dutch sources. Unable to supply our total needs ourselves, we absorb 40% of Bolivian output. America takes the remaining 60%. Under existing agreements, if America pays more for Bolivian tin, we accommodatingly do likewise. If the U.S. raises her domestic price, up goes Bolivia's selling price accordingly. This means another increase for us to meet.

Immediately we pay Bolivia more, other tin-producing areas—such as Malaya and Nigeria—demand equivalent price adjustments. A higher price to any one producer, or an increase in a country's domestic selling price, raises world prices generally. The consumer, the British industrialist, stands the racket. In effect, the present system of bulk-trading between Governments has created a vicious circle of rising prices. Nor, under this system, is there any way of checking the evil. The Ministry of Supply, Britain's official buying agent, merely passes the buck. As a common-sense business arrangement the tin deal is farcical; as an example of "control" burlesque, it is superb. Tin is one of the most controlled commodities. Five permanent committees control it, all operating at "international level." And not even the trade understands the precise purposes of all five committees.

Construction of these brains-trusts is curious. On the Management Committee of the Tin Study Group, one of the more important committees, Britain, producer of 35% of the world's tin, is represented not by the trade but by two Government Officials. Belgium, producing only 8% of the world's tin, has three representatives, two being

leading members of her tin trade. Our tin industry, plagued by recurring price increases, cites other metals virtually free from control—and corresponding price rises—and asks why tin has been selected for such unproductive distinction. Freed from this Marxian comedy of errors, tin merchants declare that free enterprise could handle all marketing problems with results especially beneficial to the British tin user and domestic buyer of tinware.

We have recently talked with members of the hardware and tin trade who say that present ceiling prices are entirely due to inexperienced Ministerial tinkering and market " control." Drop the latter, scrap the committees, say the tin merchants, then tin and tin-ware will reach industry and the home at reasonable prices.

ARE YOU A PATRIOT ?

As Professor Joad would say " It all depends." What do we mean by a patriot—Who are today's patriots ? If we were asked to define the meaning of the word we should say that, broadly speaking, a patriot is a man who does not ask for more than his share, who buys as little as possible, smokes as little as possible, goes to the dogs as little as possible, and helps check inflation by not forcing prices up either through increasing his wages or his profit.

Speaking in London recently Lord Woolton said : " It becomes not a question of securing more profits for the capitalist class, but the vital problem that is going to face the people of this country is getting the orders for our goods that will keep us with full employment here.

" Increased production, or more economic production, ought not to go to the increase of profits in a business, but to a reduction in cost of the article."

Hot on the heels of that speech by Lord Woolton—spokesman of the capitalist, free-enterprise businessman—came a Government White Paper pleading for freezing of wages, prices and profits.

Next day, representatives of some 3,000,000 workers in the Confederation of Shipbuilding and Engineering Unions decided to press forward with new wages claims. This was the climax to a week of mutterings against Government policy by individual unions. Laundry workers applied for a 10s. weekly wage rise ; Mr. Percy Belcher, general secretary of the Tobacco Workers' Union, said his organisation had every intention of aiming for a share of the industry's profits, in the shape of bigger wages ; the acting general secretary of the Chemical Workers' Union hinted at new demands for pay increases ; the national joint industrial council for the road passenger transport industry was considering a claim for new wage rates for employees on municipally-owned bus undertakings.

All this jockeying for more money to chase fewer goods, on the part of the workers jumps into perspective when set against figures published recently by economists. Wages, according to official figures, are 73 per cent. higher than before the war, but a census recently taken by the Financial Times among 30 sample firms—all household words in their own fields—shows that shareholders received 13 per cent. less net dividends than in 1938.

The Financial Times' estimates of what shareholders got is generous. A few months ago The Economist gave tables estimating net dividends of over 2,000 public companies to be only 11 per cent. greater than the prewar average. According to the same tables, wages were 30 per cent. higher in 1940 than the October, 1938, average, and 41 per cent. higher in 1941 ; in 1940-41 profits are shown to be 14 per cent. below the last prewar average, dividends 16 per cent. down—that at a time of great national stress.

With these figures in mind it is worth while asking again " Who is the patriot ?—Who is the villain of the piece ? "

Current co ng industry

TRENDS

" BRITAIN GOES AHEAD " is a slogan [illegible] convey the impression of our present energies. The Nation's inherent str[illegible] as a citadel of power leaves no element of dubity regarding our determination. Trade relations have become so closely linked with politics and diplomacy that it is difficult to see where trade ends and politics begin. That is not necessarily a disadvantage if trade relations remain good. But if they deteriorate, then the trend becomes a menace. Good business is often bad diplomacy.

Industry, free from official shackling, can show enterprise, foresight and self-reliance. With unnecessary State interference, the rhythm of production is injured, initiative clamped down and work becomes stereotyped. Freedom must not perish in the bogs and sands of doctrinaire Socialism or excessive bureaucratic controls.

One thing obvious to all is that our sacrifices and discipline are for the purpose of closing the gap in our balance of payments—so often repeated as to become like King Charles' head in Dicken's novel. This short-term necessity, however, will be without meaning unless it can be related to a long-term policy of expansion both for the home market and overseas in close co-operation with our European neighbours and in the development of the resources of the Commonwealth and Empire. With will and vision we can achieve immense prosperity by creating a vast area of interchange. But if we are to achieve this aim, we shall require to regain our independence and a new Elizabethian sense of effort and adventure.

Devalued Franc and British Industry

Amongst the pabulum in connection with the franc devaluation and institution of a multiple currency system in France, the most outstanding query to exercise the vigilance of British manufacturers, is its possible effect on our exports. It is true that the majority of French exports are in luxury goods, but such competitive trades as textiles, silks, dresses, pottery and glass will feel the adverse effect in foreign markets of the French action. Exporters across the Channel, by selling half the proceeds of their exports at the official rate and half at the " free " market rate, will receive a larger sum in terms of the franc and can reduce prices. Their desire or ability, however, to do this may be offset by rising production costs and the higher prices they will have to pay for raw materials and demands for increased wages.

Last year we imported from France goods to the value of over £30,000,000.

What has to be watched as regards our exports is the extent to which the French devaluation will tend to convert sellers' markets for British exports into buyers' markets.

There is also a serious possibility of British goods which would have gone to hard currency destinations—America, Canada, Argentina—being taken by buyers in the French monetary area for re-sale against hard currencies. The existence of a discrepancy between the official sterling-dollar rate of 4.03 and the sterling-dollar cross-rate in Paris of 3.00, makes it profitable for importers in hard currency countries to obtain their requirements of British goods through the medium of French traders and the French free foreign exchange market. The result of such practice would be that we should receive payment for exports in francs instead of dollars which would thus neutralise our great trade-gap efforts.

Obsolescence and Depreciation

Currency inflationary trends in their relationship to plant and machinery replacement costs, emphasise the need for a thorough overhaul of depreciation and similar allowances sanctioned by the Inland Revenue. Industrial and manufacturing undertakings, in striking their yearly balances, are confronted with this problem. The new construction initial allowances granted under the Income Tax Act, are helpful but do no more than permit a speeding up of the writing down of assets. What is needed is an altogether more liberal attitude towards depreciation and obsolescence on the part of the Tax authorities.

From time to time responsible Ministers abjure manufacturers to bring their plant up to date as a helpful auxiliary in lowering costs in competitive markets. But they throw out no hint regarding official help in meeting expenditure involved, or a more sympathetic fiscal definition of charges allowable for wear-and-tear, replacement and the vagaries of desuetude.

All industrialists appreciate the hundred-fold possibilities of increased industrial efficiency by plant modernisation and improvement. But strict adherence to necessitous attention is invariably prevented by the continuing need for conservation of resources in view of the fact that trading margins are often insufficient to provide the capital for a full machinery replacement programme, together with the income necessary to allow full depreciation charges and reasonable interest rates when the new capital expenditure is taken into account.

The Board of Trade, under the new Companies Act, have special powers of investigating the affairs of any body corporate. They could, with benefit to manufacturing enterprises, exercise them by suggesting a more generous allowance being made in connection with obsolescent plant and depreciation of machinery.

News and views of men who lead

QUOTING the

Benefits of standardization

MR. A. E. HUNT, Chairman and Managing Director of Singer Motors Ltd. :-

On the subject of standardization generally, our view is that a much wider field of standardization in components and accessories is necessary as well as a general reduction in models, and you may have seen in the Press that the motor industry is collaborating in these directions and that a reduction in models has already been achieved. By more standardization in accessories, components and certain units, benefit to production generally would be obtained as well as a reduction in costs, but at the same time individuality must not be lost. This could be preserved by individual manufacturers building round a smaller variety of standard components, and still having their own special units.

The " gulf " which just does not exist

MR. SYDNEY S. GUY, M.I.Mech.E., A.M.I.E.E., Chairman and Managing Director of Guy Motors, Ltd. :—

We are a " happy ship," as indeed are the very large majority of industrial undertakings, and in the main they have the same crews as were complimented for their great contrbiution towards winning the war.

We are, however, greatly concerned with the persistent references made in certain quarters to the " gulf " between management and workers when indeed no such gulf exists. Too often they are made by people whose only knowledge appears to have been gained from reading some unfortunate part of industrial history of 50 to 100 years ago. . . . . Nowadays politicians and others without industrial knowledge or training, much less managerial experience, endeavour to dictate in detail how industry should be run. They demand the greatest production but at the same time, for reasons best known to themselves, sow seeds of class dissension, which inevitably undermine efficiency. This is neither sensible nor democratic. It stints rather than stimulates production, and I feel it is high time that industry raised its voice in the interests of this nation which has been brought to such a perilous position.

This company comprises some 1,500 employees (of which I, too, am one), who are the people who really do plan and produce the goods, and some 8,000 shareholders (including some employees) who find the capital, without which we could not even commence to function. We are not an unwieldy, soulless community, neither are we subsidized by the taxpayer, and not one of us employees imagines this business to be a philanthropic institution.

I have had made an interesting comparison of the amount by which the various people concerned in our business have benefitted from the year's work :—

	£
Pieceworkers and staff drew over and above their normal rates of pay ...	84,899
The Government will collect in taxes, including P.A.Y.E.	50,216
The shareholders will receive net ...	22,262
And the company will retain for re-investment in the business ...	22,637

I make bold to say the management and men of this company, like many others, brought up in industry, knowing their work and responsibility and in consequence having a mutual feeling of confidence, understanding, and trust, do not indulge in strikes or lock-outs and, I trust, no restrictive practices. We are used to giving and receiving a square deal without fear or favour, and industrialists are not hoping for mass unemployment (which goes with a slump of orders) to reduce wages, but are striving for increased efficiency and production to reduce costs ; and reduce them we must if we are to retain and increase the export business.

What we all desire is to be left alone to get on with the job we understand, for the love of work, the fun of the game, the hope of a reward, and in the interest of the company and the country. In our own way we are one of the many examples of private enterprise of which we 1,500 are all justly proud, and, what is more, we are British. The great majority of us are tired of all this political party piffle. I have great faith in the inherent common sense of the average Britisher and that, left alone, he will in his own way and time restore us to conditions of peace and plenty.

Importance of indirect exports

MR. CYRIL C. MAUDSLAY, Chairman of Birmid Industries Ltd. :—

As manufacturers of semi-finished materials, the works comprising the Birmid Industries group do not have and cannot expect to attain any serious direct export. Despite this, however, iron and light alloy castings and aluminium alloy sheet and sections are essential

Chairman

constructional parts of a large proportion of engineering and building exportable products.

For example, the automobile industry has been given a target amounting to some 90 per cent. of its whole output for export, and thus the output from our iron foundries being very largely directed to the automotive industries will have an ultimate export percentage equal to that attained by the motor manufacturers.

The light alloy factories are not quite in the same category, but supply various high priority industries, as has been previously mentioned. Information secured from our various customers indicates that the output from our light alloy rolling mills and foundries enters as to approximately 50 to 70 per cent., into constructions which are ultimately exported.

Jobs for inefficient people

MR. S. A. SZARVASY, Chairman of Amalgamated Anthracite Collieries Limited :

It is now practically a year since the coal mining industry passed into the hands of the Government, and the very eminent men who constitute the majority of the Coal Board have had, I feel sure one of the hardest and most thankless tasks of their lives to perform. The very disappointing results of nationalization of the industry are therefore not to be laid at their door, but to the grossly inflated hopes created by years of insidious propaganda by the Socialists of the benefits nationalization would bring to the community at large and the miners in particular. Some at least of these wild promises had to be fulfilled, hence the disproportionate increase in miners' wages, shorter hours, and the many other benefits which the mining community now enjoy, with the result that coal is scarce and the price no longer competitive in world markets. Thus this country, at the time it is fighting for breath in its worst crisis, is robbed of the one raw material an abundance of which produced at the right price could help it more than almost anything I can think of to emerge victorious.

Having for years abused the coal owners for lack of enterprise, for the bad treatment of the workers and of profiteering, we now find that the Socialists are adopting one measure after another which they denied the former owners when they asked for them. As long as politics are allowed to play into business matters and jobs are found, for obscure reasons, for inefficient people, I doubt whether this all-important and vital industry can take its proper share in helping national revival and prosperity.

Controls over which we have no control

SIR BERNARD D. F. DOCKER, K.B.E., Chairman of B.S.A. Ltd. :—

I cannot tell you that it will be possible for us in the coming year to make the most of these opportunities, because this depends upon controls, restrictions, orders, and the like, over which we have no control. It seems to me that controls and regulations continually increase. The very fact of the existence of these controls brings about still further ones.

I cannot escape the view that continuance on the present course will hinder, if it does not destroy, the industrial recovery of the nation. The co-operation of industrial units and Government departments is essential—but if it is to produce the maximum of wealth for the country, the contribution of the Government must surely consist in the encouragement of the expansion of industry and the speedy removal of the delays and petty restrictions which check enterprise and depress management. We have the technical skill ; we have the machinery ; we have the will and ability to succeed—and these are at the service of the State ; it remains for Government to learn how to use them.

Improved methods reduce manufacturing costs

SIR VALENTINE CRITTALL, J.P., Chairman of Crittall Manufacturing Co., Ltd. :—

We regard it as nothing less than a national duty to fight rising costs with more efficient production. The success of this policy depends not only on the sustained efforts of our technical and administrative staff but also on the close co-operation of our workpeople. That this has been freely given can be measured by a substantial increase in piecework earnings over the period, and it is gratifying to note that the costs of most of our products show little increase over the period in spite of all-round increases in materials, freights, etc.

For instance, a certain type of standard window cost 29s. 6d. in August, 1946. Had the same manufacturing methods been employed a year later the cost of the same window would have been 31s. 5d., whereas, in fact, it was 29s. 9d., and other improvements in method are on the way which will further reduce this figure.

EFFICIENT PRODUCTION *in the Post-War period*

BY G. R. FENTON

The author points out that the conditions appertaining today are vastly different to those of the war years and a good deal of analysis and adjustment can be carried out to bring most organisations into line with current conditions.

To regain the high standard of living enjoyed by the British people before the war, production must be as efficient as possible. Many concerns have not yet recovered from the disorganisation and excessive costs resulting from war-time conditions. Nevertheless, without cutting out all unnecessary expenditure in manufacturing and distribution it will be impossible to provide the cheap goods and services on which a high standard of living depends. Similarly it will also be impossible to compete in foreign markets with the products of more efficient low-cost manufacturers such as the Americans.

Lewis Ord (in his "Secrets of Industry") has drawn attention to the very great differences in costs of manufacture as between America and Britain and in the last two years there have been issued a considerable number of reports which draw attention to the same fact. What can be done to remedy the position ?

Expenditure classification

It is clear that many excessive costs can easily be eliminated by just a little effort. To do so it is not necessary to instal any elaborate cost system. The points for attention can quite easily be spotted without carrying out a detailed investigation. The results in the case of most organisations will easily justify the slight effort involved.

When one remembers that for a very large part of the war the need was for production at any price, it is easy to understand that many procedures were adopted merely to achieve a little extra output without regard to cost. To check up on some of these cases of wastefulness it is only necessary to review the organistion broadly. The points to which attention should be given can be conveniently considered under the normal costing classification of expenditure as follows :—

1. Labour.
2. Material.
3. Overheads.

Let us consider Labour first of all.

Where a new product is being manufactured it is essential that the rates paid for the job are not excessive. They must be fair but not more than so. During the war in the cases of many operations bonus was paid and rates were fixed far in excess of what would be permitted (and reasonable) in peacetime. The methods whereby rates are fixed should therefore be reviewed to make sure that those responsible are fully alive to the fact that competitive conditions have returned.

Another point is that as far as standard operations are concerned it is essential that they all should be the subject of process sheets. Often enough during the war period jobs were given out unsupported by any paper work. This meant additional effort on the part of supervisory staff and therefore an additional cost—difficult to assess but nevertheless real That was inevitable under wartime conditions. It is no longer necessary. If it happens now it is evidence of weak works management.

Then again proper planning of functions should ensure that adequate production engineering is carried out. During the war there was not time and sometimes there were not enough staff to carry out efficient production engineering. That is no longer the case and the importance of good production engineering in cheapening the cost of manufacture is beyond dispute.

If we next consider materials it is obvious that in the case of many concerns the care with which materials were stored and consumed before the war is lacking. It is necessary to re-instate in the minds of employees the attitude that materials represent money.

For a start, a check on excessive scrap and mortality should be made. If no records of scrap are available some should be prepared. It is surprising how the mere knowledge of the fact that excess scrap will be investigated will itself have a considerable effect in reducing the wastage of material.

It is a simple matter also to check up on the stores position. Are there excessive stores losses ? Is the recording of receipts and issues of materials being carried out accurately and timeously ? If there is not already a perpetual inventory system in operation then the cost of having one may easily be justified and may, if the procedure is agreed with the accountant of the organisation as adequate, enable a physical stocktaking at the end of the financial year to be dispensed with. This in itself will cut out unnecessary interference with production and consequently will reduce excessive costs.

At the same time, as space is very valuable it is desirable to check up whether or not too much stock of certain items is kept. Too great stocks not only put pressure on space but also lock up capital.

Overhead expenses

A further point is that the correct binning of materials should be given attention. If left unsuitably binned, materials may suffer damage or deteriorate.

The greatest scope for economies comes in the case of overhead expenses however.

Where there is already in existence a system of departmental costs it is easy to get at the significant figures. The figures should be studied in detail but even where no departmental costs are available, some figures can be easily obtained and used as a basis for checking unnecessary expenditure.

To begin with, each class of non-productive labour should be considered in turn. This will involve a visit to each department or shop and an examination of the personnel carried on the pay-roll of that shop. The departmental head has lists (or should have lists) of all individuals who work in his department and those lists should be scrutinised thoroughly. Each individual worker should be considered in turn and his each function noted. From this information it will be possible to gauge whether or not he is required for the efficient working of the shop.

Stores and storekeepers

It may be for example that there are too many supervisory staff—e.g. Foremen or Charge Hands. If the types in production have now become relatively static there may be scope for economies here. During the war, where there were so many modifications and changes in programme, there was inevitably a tendency to have more supervisory personnel than are necessary where production programmes are more stable. Where production expanded during the war, necessitating more supervision, there has been a tendency for the same number of supervisors to be retained even where production has fallen.

The position of storekeepers should be checked up. Too often there is a tendency for the head of a department to retain a small store under his own control. This of course in most cases is quite unnecessary and some economies may be achieved by transferring the materials concerned to the stores proper where in any case they will be under more expert supervision. In addition, by moving them to a central store, the total stock commitment may be reduced.

Again there may be too many labourers attached to a department. There should be a central pool from which labourers can be drawn as required. There is a tendency for the departmental manager or foreman to retain personnel for functions which can quite easily be catered for by a central source. Where labourers are departmentally controlled, supervisors, already absorbed in the main task of production, sometimes forget their very existence with the result that they have often slack periods and in any case the department may not need their services for the whole of the working week.

Similarly there may be too many maintenance men, particularly where these are attached to specific shops. They should

definitely be controlled centrally. If it does not already exist some method of controlling the activities of maintenance labour should be instituted, e.g. by prohibiting all repair work except when authorised by proper Maintenance Job Orders. This ensures that maintenance men do not fritter away their time on small jobs which cannot subsequently be accounted for.

In the case of inspection the nature of the product may have changed so much that the number of inspectors needed now is very much less than during the war. The peacetime product may be much less elaborate and in any case there may exist simpler checks. The possibility of Quality Control should not be overlooked. It was applied very successfully in many industries during the war where at first sight it did not appear as if it were suitable.

Clerical staff

The question of weekly salaried staff should also be given due consideration for the clerical work required in connection with government contract production entailed very often a greatly increased staff. This is clearly so in the case of billing deliveries under government contracts for the procedures involved required a great deal of recording. The position was often aggravated by the need for waiting until prices were agreed. The change over to normal civil production usually requires a smaller clerical staff, as the recording for ordinary civil sales is much simpler. The same is partly true of all production control and stores records for a reduction in the volume of stocks held and conditions approximating to flow production need much less clerical personnel. Consideration of present needs may throw up cases of superflous staff.

As to non-productive materials steps should be taken to check up on excess consumption, whether arising from pilfering or abuse. During the war many of the old controls lapsed, and these checks should be reimposed wherever practicable. As it was then clearly realised that government departments reimbursed all costs whether excessive or not there was a considerable tendency to laxness. Supervisors should be instructed to tighten up on all consumption of non-productive materials and should endeavour as far as possible to inculcate a feeling of cost consciousness into the actual operator.

Where machinery has become redundant it should be sold if this can be done profitably. If not it should be stored away (assuming that subsequently it can be disposed of more profitably) after due precautions for its suitable care have been made. In any case the space it formerly occupied must be freed for other uses.

This raises the question of layout which should receive thorough consideration. If necessary it should be altered from that suitable for government contract work to that suitable for civil production. The first step in so doing is of course for a flow chart to be drawn up. This has the advantage of focussing attention on the significant points and will give considerable assistance in deciding on changes in layout. Many developments in labour saving machinery have resulted from the war. Full advantage of these developments should be taken where applicable.

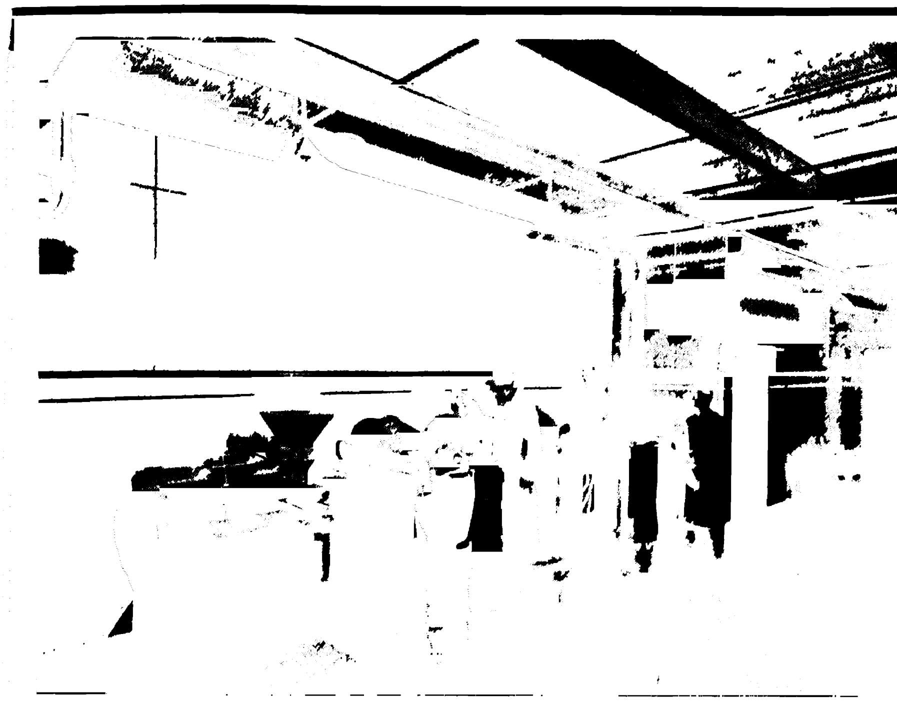
Another point on maintenance is that a rigid programme of inspection should be laid down. It will be found that by so doing a stoppage of production arising from machine breakdowns can more easily be avoided.

On the side of administration generally it will be found that some factories through wartime necessities, greatly increased their administrative services. Such services were adequate where a large volume of work was concerned but, like some of the superfluous clerical staff mentioned above, cannot be absorbed by the smaller volume of civil production which is now being carried out. Cutting down of administration to the real needs of the organisation must be carried out.

Analysis of expenditure

As mentioned above where departmental cost summaries exist the above information is readily available. In many concerns however such information is not automatically produced, but it should be possible to obtain easily an analysis of certain classes of expenditure—those which are in fact controllable, and in regard to which the greatest economics are possible. For example productive and non-productive labour can easily be analysed into expense and department.

The same can be done with non-productive materials, with office salaries, with direct purchases (that is, purchases other than those going into stock), and with petty cash payments. Without going to the trouble of preparing complete departmental cost summaries, analyses such as the above carried out only once a month provide valuable information on which economics can be based and efficiency improved.



SOUND CONDITIONING

as an aid to efficiency

BY FRANCIS A WESTBROOK, M.E.

THE application of acoustical treatment in noisy industrial plants received a great impetus during the war because of the urgent necessity of doing everything possible to remove handicaps to maximum production. Although costs are generally a minor consideration under war conditions when national safety comes first, it was found that the increase in productive efficiency realized from acoustical treatments was so great as to pay a handsome dividend in almost all cases.

As a result our American contemporaries believe that the practice of noise abatement has come to stay and it is being applied as a normal procedure in ensuring good working conditions. The large number of women now employed for industrial production who are, in general, more sensitive to noise than men is another reason why sound conditioning is of increasing importance.

Numerous investigations by physicians and engineers as to the physical effects of exposure to noise have shown that not only may it lead to deafness and cause a fear reaction, but that noises louder than the human voice interfere with the secretion of saliva and depress digestive contractions of the stomach, cause contraction of the muscles and constitute a serious hazard to the nervous system. Carey P. McCord, M.D., of the American Industrial Health Conservancy Laboratories, and a member of the Advisory Committee, National Noise Abatement Council, says, "There is both practical and experimental evidence that noise has been responsible for impaired hearing, fatigue, neuroses, increased blood pressure, and decreased working and mental efficiencies." Dr. L. Grant Hector, a University Doctor, also states that "In mental work the adverse effects of noise are more

Fig. 1—This small and very congested machine shop has a ceiling of perforated acoustical tiles. Sound is absorbed instead of being reflected.

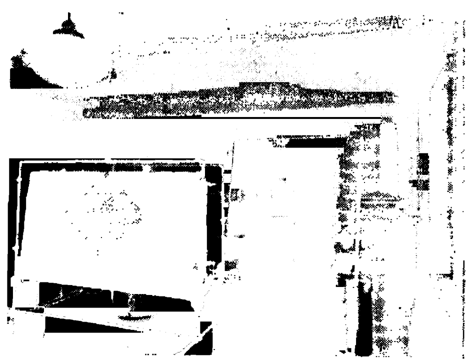


Fig. 2—For deadening the noise which is so prevalent in a bottling factory this firm use roof tiling of the "Cushiontone" type.

noticeable in accuracy than they are in speed."

The latter is, of course, an important consideration where close mental concentration is required in noisy surroundings, as in machine shops, assembly operations, etc. Probably there are very few industrial plant managers who are unaware of the undesirability of excess noise, and it is therefore pointless to quote any more of the many competent authorities who have expressed themselves.

Sound into heat

The materials usually adopted for sound conditioning are porous, being made of cane and mineral fibre. The porous character is greatly enhanced by perforations which show very plainly in the illustrations. Sound waves enter these spaces and encounter resistance which transforms them into heat, thus absorbing most of the sound instead of reflecting it. While the acoustical material does not affect the noise at its source, by greatly reducing the reflection of the sound waves back and forth between ceiling and walls, hundreds of times a second, the damaging result of the noise is very substantially curtailed. Thus the noise emanating from a punch press, band saw, power hammer and many other machines and operations is not amplified by repeated reflections if the waves immediately impinge on acoustical material.

Acoustical material, frequently in the form of tile, say 12 inches square and on the average ½ inch to 1 inch thick, depending upon the absorption capacity desired, is applied to the ceilings of the spaces where the noise source is located. This is usually enough as the sound waves strike the ceiling before much, if any, reflection takes place and are absorbed. However there are conditions where it is advisable to treat the walls as well, in order to obtain satisfactory results.

To secure the best results the acoustical treatment must be varied to meet local conditions. Each manufacturing area must be studied and analyzed, taking into consideration the shape of the space, the source and character of the noise and degree of abatement sought. The sound conditioning engineer, who knows the sound absorbing capacities of the materials normally in the space and how much the noise levels may be profitably reduced, can calculate how much acoustical material is needed to secure the desired abatement.

Certain types of acoustical tile can be painted whenever desired without damage to their sound absorbing properties. This is especially true of the fibrous, perforated tile, which in general is also the least expensive. Other types of material usually used where decorative effects are of primary importance cannot be painted without destroying their acoustical efficiency, and still other types call for very expert work with special paints.

A few specific installations

Acoustical tile is usually easy to install for the sound conditioning of existing buildings without making any structural changes. Installations can almost always be made without interfering with production schedules, and both material and installation costs are surprisingly low.

The application of acoustical treatment under various conditions can best be shown

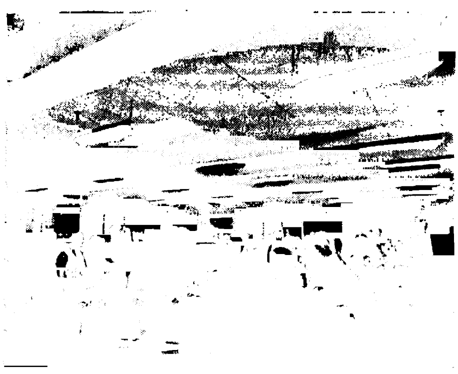


Fig. 3—The large tiles of "Acousti-Celotex" used in this shop have unusually good light-reflecting properties as may be seen.

by considering a few specific jobs. Thus a concern with its offices and manufacturing department on the same floor of a concrete building had a noise problem due to the heavy machines. The workers in both spaces were subjected to a severe strain as a result. An Acoustic-Celotex (a fibrous, perforated tile made by The Celotex Corporation, Chicago Ill.) ceiling was installed over the entire shop and office space and a Thermex partition between the two. The result, according to the management, was almost complete elimination of noise in the office and much less tiring conditions for the shop workers. Appearances were also greatly improved with the new covering for the ceilings, and the installation was made with practically no interference with operations.

Another example is the acoustical treatment of the ceiling of a drop hammer and press room which retards spreading of the noise and building up due to reflection. This relieves the operators from noises coming from nearby machines and each hears mostly the sounds from his own machine, and of course he knows when that noise is coming. As one of the worst features of loud metallic sounds, such as emanate from drop hammers, is due to lack of expectancy by the hearer, the latter feature is very important. In addition to this the acoustical ceiling largely prevents the spread of noise to other areas where it had previosuly been very annoying.

A third company installed a similar ceiling in a department equipped with small riveting machines and where the operators are girls. This is shown in Fig. 4. Experience indicated that when this department was moved to another building it would be advisable to apply acoustical tile to the ceiling to control the noise, due to the high speed hammers. Nerve fatigue among the employees operating this equipment had been high and sound conditioning materially reduced it. The acoustical tile was nailed to wood furring strips and in this case, due to the construction of the building, also provided good heat insulation.

Fig. 2 shows a bottling plant with an acoustical ceiling of Cushiontone (made by the Armstrong Corp. Co., Lancaster, Pa.). This is common practice with the firm concerned partly because of its policy of encouraging the public to make visits, often in rather large groups, such as women's clubs and so forth. Quietness makes a favourable impression and also enables the guide who is showing the group around to make himself heard without undue effort on the part of the listeners.

In some cases the tile is cemented to a concrete ceiling, or wall. This was done in the small machine shop (Fig. 1) of a jewellery manufacturer. The shop is equipped with the usual lathes, drill presses, grinders, shapers and milling machines where many of its own tools are made and production developed. This calls for much thought and mental concentration by the highly skilled workers to whom noise is a fatiguing handicap. The room is small and there is a tendency for noises to build up to a very annoying extent. Consequently the management decided that it would be well worth while to install sound conditioning and the results have amply justified that decision.

In the examples so far considered the acoustical treatment was applied only to the ceilings. However, as already pointed out, this is not always enough.

Please turn to page 74

Fig. 4—Riveting roller bearings is another noisy operation that was considerably improved by this special ceiling material.

JOTTINGS

BY SPEEDING UP CONVEYOR BELTS from 165 feet a minute to 210, the Triplex Safety Glass Co., Ltd., have increased their output of laminated safety-glass by 27 per cent. in recent months. Eighty-five per cent. of this output goes to export. By reducing the time taken to achieve a given output, this speed-up has reduced electricity consumption by one-sixth. Mr. Arthur Cochrane, works director, said: "This increase in efficiency was brought about by thorough co-operation between management and workpeople. We are always seeking improvements, and it so happens that our latest one is helping to save power during the winter months."

AMONGST THE IMPORTANT orders in hand with the B.T.H. Company is one for the complete motor and control equipment for a new-mill overseas manufacturing wall-board from straw. This involves some 150 motors and an elaborate conveyor system with sequence interlocking for handling the boards throughout the process of manufacture.

A KNIFE THAT CAN CUT SLICES four millionths of an inch thick has been demonstrated to scientists in Philadelphia. It consists of a circular disc which turns at a speed of 60,000 revolutions a minute. We understand there is no truth in the rumour that the Food Minister is considering its importation to assist with the bacon ration.

COLONIAL IMPORT POLICY HAS been reviewed by the British Government. It has now been suggested to Colonial Governments that there is no objection to their relaxing restrictions on the import into their territories of goods from the United Kingdom and colonies which do not fall within the following categories: (1) Can be sold for dollars or hard currencies; (2) are made wholly or largely of dollar materials; (3) are in short supply and can be used in trade negotiations to obtain essential supplies. Other goods may be imported to the extent possible without detriment to the sterling balances of the territory concerned.

The Editor invites reader firms to send him details of new plant, processes, equipment or tools for inclusion in the Equipment Supplement.

THE BRITISH ALUMINIUM CO. Ltd. advise us that their Midland Warehouse at 17/18, Providence Street, Cradley Heath, Staffs., is now in full operation. The telephone number is Cradley Heath 6881. The Midland Branch Office remains at Lansdowne House, 41 Water Street, Birmingham 3. (Telephone No.: Central 3053; Telegrams: Britalumin Birmingham).

THE 1948 CATALOGUE OF P. C. Henderson Ltd., Barking, Essex, collates the experience of many years in design and manufacture of sliding door gear for all purposes, from small cupboards to milk bars, garages and aerodromes. This valuable reference book presents structural details, weights, and prices of all components; and drawings and photographs assist in choosing the best type of door gear for any set of circumstances.

THE WORLD'S LARGEST BICYCLE and motor cycle show is to be held at Earl's Court, London, from November 18 to 24, the British Cycle and Motor Cycle Manufacturers' and Traders' Union announce. It is the first to be held since 1938.

NEW TYPE OF ELECTRICALLY driven dump truck for handling loose materials is marketed by Messrs. Crompton Parkinson, Ltd., Aldwych, London, is a 1-ton flat deck truck mounting a 15-cwt. capacity side-tipping hopper. Fully loaded, the truck will do 16 miles at 4.6. m.p.h. on one charge of the battery and will climb a gradient of 1 in 7. It has a wheel base of 3ft. 11 ins. overall length 8 ft. 1 in., overall width 3 ft.

COLOURS WILL BE INTRODUCED into the Morris car range later in the year. Bodies finished in platinum grey and in green will be available on Morris Eights and Tens in addition to the range of black cars.

THE CENTENARY OF CASTONS, recently celebrated, brings to the forefront the great achievements which have developed from the opening of a small wire lattice shop in Great Dover Street, Southwark, London, a hundred years ago. The firm's principal factory is now the Tabard Street Works. Closely associated with the lift business since the lift was invented, Castons later extended their scope to wrought iron work; "Castadors" for fire protection aboard ship and in city buildings gained a big reputation. During the war years the firm's activities in the service of Britain were multifarious and their war developed resources and experience are now turned to reconstruction and export. Their output is mainly welded, fabricated sheet metal and steel plate work for gas works and power station construction.

PHOTO *of the* MONTH

Electronic Processing

The application of electronic techniques to industry is extensively surveyed, with the primary object of stimulating interest in the use of such techniques as an aid to industrial efficiency as it is felt that many industries have not yet been made aware of the versatility and great possibilities of this new branch of engineering.

THE FINAL ARTICLE OF THE SERIES BY D. M. SWATTON

IMPROVED methods of inspection obtained by applying electronic techniques, (discussed in previous articles) useful though they are, may not necessarily make much difference to output per man-hour if the work processing time is high compared with the inspection time. When an electronic technique involves the services of an operative, although a greater accuracy of inspection is practically certain, so that less bad work will be passed, the rate of production may remain the same as before because the processing time is the controlling factor. Reduced inspection time may simply result in an operative having time to spare between work arrivals. On the other hand, however, with a given rate of production an electronic inspection technique may be so rapid that the number of inspectors at each stage can be reduced.

But there are cases where the processing time is such that nothing is gained by applying electronic inspection apparatus, unless at the same time processing can be speeded-up. Because the initial cost of electronic equipment is high, generally it is justified only when it will be in use continuously throughout the working day. If by means of an electronic technique inspection can be made automatically instead of by an operative then something is gained, but in many cases the number of operatives employed is fixed by the nature of the processing.

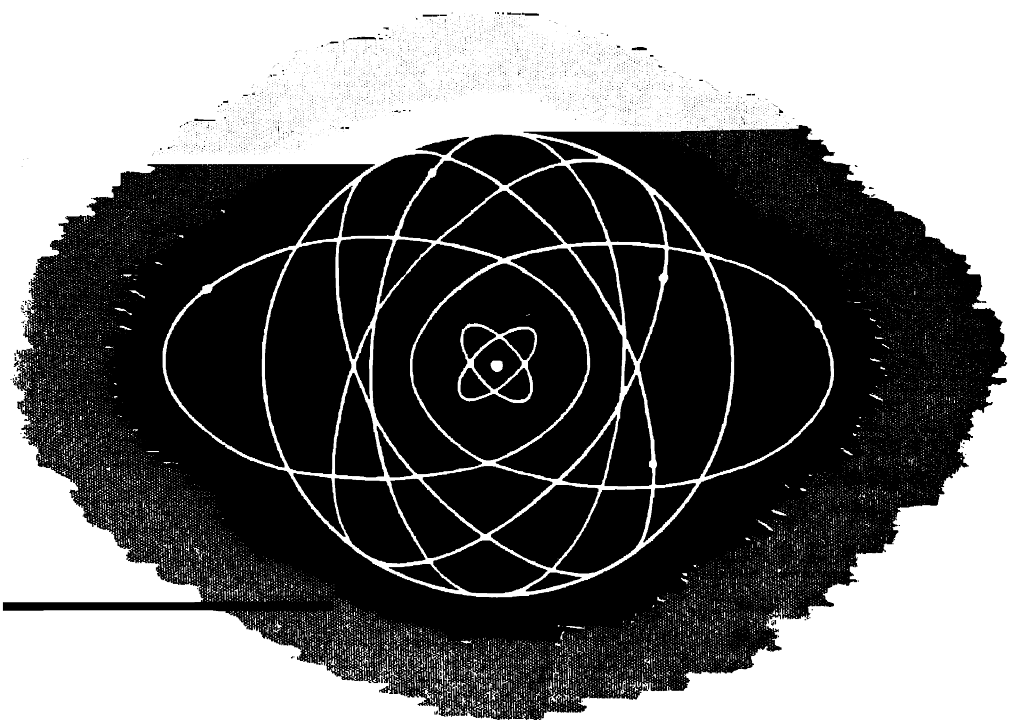
So the question is: What can electronics do to speed up processing? It has already been partly answered in the previous article, which showed that automatic inspection can in some cases be allied with automatic control to achieve a greater speed of processing, apart from providing for better quality or reducing the amount of defective work.

The present article is concerned with electronic aids to processing irrespective of whether they are associated with electronic techniques of inspection.

Speed of processing often depends upon the precise control of a machine. Most machines are driven by electric motors, which are inherently susceptible to precise and automatic control by electronic methods and equipment.

For machine tool drives electronic motor control equipment can provide a variable speed range of 100 : 1. A typical equipment is shown in Fig. 1. On the panel are two large valves that rectify the ordinary A.C. supply to make D.C. available for the motor, and other valves and apparatus for obtaining the required operating characteristics. The other two items are a power transformer for supplying anode power to the rectifier cir-

INDUSTRIAL APPLICATIONS OF ELECTRONICS



cuits, and a unit for starting and stopping the motor and adjusting its speed.

Speed regulation is effected, for a certain range of speed, by varying the voltage applied to the motor armature; and for the widest range of speed, by independent variation of both armature and shunt field applied voltages. The motor speed is infinitely variable throughout the range, and any selected speed can, if required, be maintained within close limits up to about 110 per cent. of full load. Overload protection is inherent because the electronic circuits prevent the armature current exceeding a pre-set value. This means that the output torque is limited, so that apart from the electronic apparatus and the motor being protected against excessive current, the machine tool is safeguarded against mechanical strain in the event of an abnormal load being imposed. For instance, in the case of an electronic controlled drive applied to a drilling machine, if the speed is excessive the load is too much for the motor so that it is pulled up and breakage of the tool is avoided.

Various arrangements of electronic motor control have been developed for every kind of drive involving special requirements. Typical applications are dynamometers, type building machines, glass working and textile machinery, testing machines.

One important field of application is the control of tension during reeling on wire drawing machines, wire covering machines, paper machines, cable reeling machines, and so forth. The requirement is to reel-up a continuous length of material, and to effect this at high speed without breakages the mechanical tension must be closely controlled. Any method that provides for closer and automatic tension control may allow processing to be carried out at a speed higher than that permissable with the customary method. An orthodox method of tensioning is to support a weighted roller by a loop of the material. If a single loop or bight is used, then the weight of the floating roll is twice the tension required. The problem is to keep the tension approximately constant, by ensuring that the delivery and reeling speeds are equal. Any difference in these speeds will cause the floating roll to rise or fall, as the case may be, and this tendency to variation is used to operate apparatus for electronic control of the reeler motor speed, to keep the reeling speed equal to the delivery speed. Fig. 2 shows a typical scheme for tension control. The floating roll is coupled to an iron core free to move up and down inside a coil, the combination of core and coil being known as a variable reactor. Movement of the core varies the inductance of the reactor, and thereby

varies the value of the voltage applied to an electronic detector. It is clear that any tendency for the floating roll to alter its position results in a change in the control circuit. If the roll descends the motor speed is increased, and vice versa. A movement of anything from a fraction of an inch to several inches, according to the application, can be made to vary the speed from zero to the maximum. The sensitivity of control allows for exact matching of reeling and delivery speeds, and as there is practically no change in tension, the maximum rate of reeling can be maintained without danger of a breakage Reeling speeds up to several thousand feet per minute can be obtained.

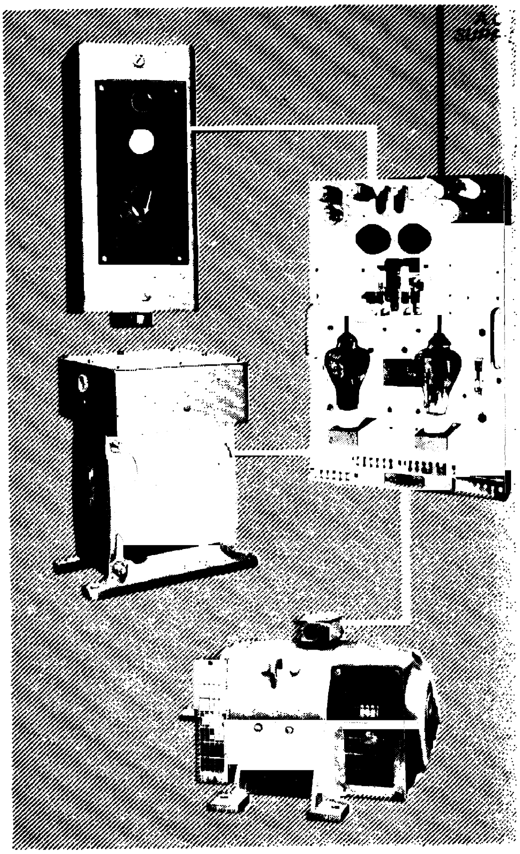
When it is impracticable to use the floating roll method of tension control, an alternative is a photo-electric scanner which " watches " and regulates the motor speed so as to maintain a loop of approximately constant size.

Sequence timing

Apart from regulating motor speed, electronic equipment can control the sequence and timing of machine operations. By fitting mechanically or light-operated trip switches to machine tools such as drillers, lathes, presses, millers, etc., switching sequences can be prearranged to perform repetition jobs in the minimum time without attention. With a milling machine, for example, electronic control can feed the cutter at a pre-selected speed ; change the speed after a few seconds ; reverse the motor when the operation is completed, and then stop the machine.

Applied to resistance welders, electronic control can ensure high speed and consistent quality in spot, projection, and seam welding operations, by providing precise timing of the welding period. One class of apparatus controls the welding current by means of an electronically-timed magnetic contactor switching the primary circuit of the welding transformer. The timer provides for weld times from one-tenth to ten seconds, and can operate at 150 welds per minute.

For high power welding the " ignitron " contractor is available. It consists of two ignitrons—a special form of water-cooled electronic rectifying valve—each of which acts alternatively as a switch during one half-cycle of alternating current. When a control switch is closed an arc is struck between the anode and the cathode (a pool of mercury) of one of the ignitrons. The arc completes the circuit to the primary of the welding



transformer, but it is maintained only while the A.C. voltage is acting in one direction. As the voltage decreases (after it has reached its maximum value), when it is nearly zero, the arc in the ignitron goes out, and the current flow stops. After the voltage has fallen to zero, it begins to increase again but acting in the opposite direction to that before, and then an arc is struck inside the other ignitron so that current again flows through the welding transformer. The action is that first one and than the other ignitron makes and breaks the circuit as the alternating voltage changes in direction, but the action will be maintained only while the control switch is closed. In practice, the switch is operated by an electronic timer. This has only to make and break the small current that flows to an "igniter," inside the ignitron valve, which actually starts the arc when the applied voltage is in the appropriate direction. The welding transformer current is controlled by the ignitrons which form, in effect, a simple switch without any moving parts, and nothing

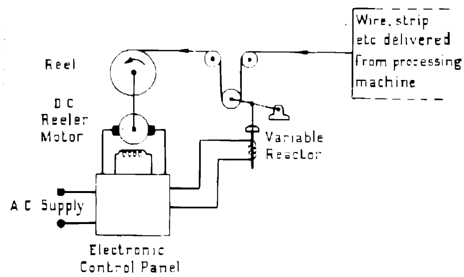


Fig. 2—An electronic tension controlling mechanism. Fig. 3 (below) Part of a battery of spot welders with electronic weld current control.

On the left (Fig. 1) is shown the link-up of units for electronic control of electric motors and similar gear. Switching sequences may be pre-arranged and speeds pre-selected.

to get out of adjustment. Little maintenance is required, and the equipment operates without noise. Many equipments have been in service continuously for several years, and made millions of welds, but never been opened up for even a brief inspection.

Welding control timing

For welding jobs requiring a time of less than one-tenth of a second " synchronous " electronic timing control is used. The timing equipment is so sensitive that it can start the welding current, through the medium of an ignitron contactor, at the beginning of a half-cycle of voltage, or stop it at the end of one. It can thus provide for a weld time as short as half a cycle (0.01 second, with standard frequency of 50 c/s) ; and accuracy of timing can be maintained continuously under normal factory production conditions. Because production speed is accelerated, output can be greatly increased. Moreover, the system ensures welds of consistently high quality. Maintenance of the electronic equipment is practically negligible, and the life of valves correctly rated in the first place, runs into years.

Among the many resistance welding techniques that can be improved by electronic control is " programme welding " of aluminium alloys. This is a form of spot welding that gives improved quality by immediately reducing the current, after the weld has been made to about 30 per cent. of the normal value, for a pre-determined time. This post-weld current retards the cooling of the weld, annealing the section and relieving any strains which might otherwise be set up. Fig. 3 shows two of a battery of programme spot welders for aluminium alloy parts. One of the electronic controls can be seen behind the machine.

A large number of industrial processes involve heating. In many cases, it is likely that existing methods are both the most economic and effective applicable, but for certain processes electronically generated high-frequency currents can be used advan-

tageously to heat both conducting and non-conducting materials.

The frequency range required to cover different heating applications is from 1,000 cycles to about 200 million cycles per second, and although non-electronic equipment is available for the lower part of the range, electronic high-frequency generators are now used almost exclusively above 200,000 cycles per second.

The H.F. generation is effected by an appropriate combination of coils and condensers, which form an oscillatory system energised by electrical impulses produced by the action of an electronic valve.

There are two methods of using the high-frequency currents. One method gives "eddy-current" heating of metals, such as iron, aluminium, brass, which are good conductors, by surrounding the material with a coil carrying the H.F. current. The "field" set up by the electrons moving in the coil induces a movement of electrons in the material. Because of the high frequency, the electrons are moved first in one direction and then in the opposite direction at a very rapid rate, so that there is little time available for them to be caught by the positive attractive forces of the atoms. In consequence, a comparatively large number of free electrons are kept on the move as an "eddy" current. For a given heating coil H.F. voltage, the current flowing in the material is many times greater than it is at ordinary supply frequency.

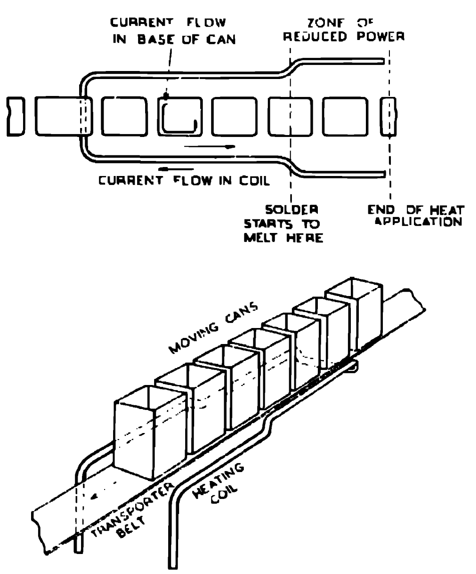


Fig. 4—Set-up for the automatic soldering of tin can bottoms on the production line.

Eddy current heating is being used for annealing metal tubes and sheet, for welding pipes, for brazing tool tips, melting alloys, for surface hardening of gears, shafts, cylinders, and so forth.

A particularly good application is for soldering because with the comparatively low temperature required the coil can be arranged to provide local heat exactly where it is required.

Heating coils can be shaped to suit any particular job, and be installed as part of a production line. Fig. 4 illustrates these points. The ends of tin-plate cans are being soldered automatically to the sides. At the bottom of each can is a loop of resin-cored solder, shaped to the can. The cans are carried through the coil, which is shaped to melt the solder at a certain point in transit, and then to provide reduced heating for a time sufficient to permit easy flow of solder.

Dielectric heating

The second method of electronic heating is used for non-conducting materials, being known as "dielectric" heating. With this method the material acts as the "dielectric" of a condenser, between two parallel flat plates or electrodes, to which a H.F. voltage is applied. The heating results from the powerful electric field between the plates violently agitating the atoms of the dielectric material owing to the high-frequency reversal of the polarities of the plates at each half cycle.

Because dielectric heating is due to actions inside the material, as distinct from other methods where it has to be transmitted to the interior, the temperature rises at a practically uniform rate, and therefore heating is very rapid. Apart from increasing the speed of the heating, this method often gives results not obtainable in any other way, and is clean and compact.

Dielectric heating is being used in such processes as the production of glued plywood, the curing of rubber, and the softening of plastics. The method is likely to have definite advantages for, to mention only a few examples, treatment of foodstuffs, the cementing of furniture in place of glued joints, and the production of new materials comprising paper with resinous or plastic impregnation, or compressed wood impregnated with resin.

In this survey of electronics an attempt has

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PLANNING FOR EFFICIENT SMALL - SCALE PRODUCTION

From our Industrial Correspondent

R. KING

A NUMBER of industrial products are now being manufactured which were developed during the war but were not available to the public until recently. Since they now depend upon the public's approval for their success, these products are often manufactured on a rather small scale. Unlike the case of large production runs, the cost of manufacture is high. Lack of experience in manufacturing methods and production control, and variations in product specifications, are the main reasons for the high manufacturing cost.

It would pay, however, to spend time on standardising production procedures and to lay out the flow of production according to methods usually employed in the manufacture of large quantities. Proper planning and utilization of previous experience, combined with some ingenuity, will make it possible to produce products at a reasonable cost, even if they are made on a comparatively small scale.

Small production layouts are often planned to fit into existing surroundings, with the idea that no money should be spent for machinery and working equipment which might have to be discarded within a short time. This line of thought does not take into consideration the fact that increased labour cost due to waste motion mostly outweighs the original saving, and that it is extremely difficult to make a product of consistently good quality with unsuitable equipment.

Using machinery not entirely fit to manufacture a certain product has further disadvantages : if a machine is overloaded, its natural life is often reduced, and if only part of the machine's capacity is used, manufacturing costs increase unduly.

The manufacture of products in small units requires accurate accounting, a good sales forecast, efficient production scheduling and, above all, full use of labour and materials, if unit costs are to be kept within reasonable limits. Accounting figures should be based on rue records of actual performance, and not derived by averaging the cost of large production runs and adding an arbitrary percentage to compensate for the higher costs involved in small production runs.

A job-cost system should be used for small scale runs in order to obtain actual costs. By no means should a standard cost system be employed, since the establishment of standards will have to be based on related experience, which is often misleading. Production executives should be supplied at short and regular intervals with statistical information which will tell them if the changes they have made have increased or decreased the manufacturing cost. This is necessary because savings in one direction frequently increase the cost in another, and these increases often cannot be detected and seldom can be evaluated without the accountant's help.

It is difficult to foretell the sales volume of new products which are usually made in small quantities. Sales departments should, nevertheless, give production executives figures of anticipated sales. If any guessing has to be done in this respect, the sales department should do it.

On the basis of figures obtained from the sales department, the production executive will have to schedule his production. Top management sometimes does not realize that laying out production on small runs involves just as much, and sometimes even more, work for the production executive than setting up a big production. This is due to the fact that services usually available to him, such as assistance from the industrial engineering, account and engineering departments, are often not at his disposal.

These organizations are likely to be working on other more important projects, or they cannot render any assistance because the production executive himself often has no clear conception of the flow of work until many small difficulties have been ironed out. Top management, therefore, should give pro duction executives sufficient time to set up the

new production, and should not think that the organization of small scale production is a minor task which can be handled as a side line.

All department heads who are involved in production should discuss their problems together before they decide on the flow of production or the production layout in their departments. This is necessary in order to establish temporary standards and to eliminate duplications. For example, opinions frequently vary in regard to the type of material which should be used for equipment. It would make no sense if one department head insisted on the use of stainless steel or nickel tubing while another department head advocated ordinary steel piping.

The grade of raw materials to be used should be decided by all department heads if no specifications are available. The extent of testing the product during its manufacture should be the same in all departments, and duplications should be avoided. Frequently products are re-tested simply because they enter a new department ; but if no change has taken place since the last test has been made, the department receiving the material should accept the test results of the other department. If a department head does not rely on a test made by another production department, all tests might be conducted in a centralized unit, such as a research laboratory, if no production control laboratory is available.

It is sometimes possible to transfer equipment from one department to another or to route the flow of production in such a manner that idle equipment in the plant can be used even if the product has to be moved from one department to another and back again. Insisting on a straight flow of production, and insisting that a product which has left a department should not be returned to it, often causes costly installations which could be avoided.

The flow of production in individual departments should be carefully planned. Although existing equipment might have to be used, there is no reason why it cannot be temporarily altered to suit the new production scheme. Heights of tables, for example, can easily be changed, even if it should become necessary to instal new legs when the temporary layout is completed. Furthermore, movable equipment allows a saving in floor space. Installing casters on tables, and setting storage containers and even vessels used for manufacturing on to trucks, should be considered.

Sometimes it is possible to change equipment in such a way that it can be used for two purposes. Instead of blocking a production area with a table which is only occasionally used, the table top can be installed with hinges on the wall, clearing the area usually occupied by the table, to make room for other equipment

A production executive sometimes hesitates to manufacture various types of products in one area, because he fears mix-ups and contamination of products due to improper use or improper cleaning of equipment by employees. Conditions of this type can often be overcome by using colour schemes or certain types of containers which vary according to products. The writer once saw a rather interesting set-up where every piece of equipment was marked with some particular colour, to indicate the type of product for which it could be used ; here operators did not seem to have any difficulty in selecting the proper equipment.

Almost exclusively, labour is a factor which increases the cost of products manufactured on a small scale. This is only natural because often one has to work with makeshift equipment and untrained personnel. Nevertheless, labour figures can usually be reduced considerably if the following steps are taken :

Production personnel should be made thoroughly familiar with the product to be manufactured. Their suggestions in making improvements should be welcomed. Workers should be cautioned against possible difficulties which might arise and should be warned that unauthorized changes will not be permitted. It would be good policy to call attention to obviously imperfect installations, and to explain why better equipment or methods cannot be used at the time ; such an explanation will prevent submitted suggestions which cannot be put into practice and also will eliminate unjustified criticism which is always likely to be offered when workers are asked to participate in affairs of management.

In order to keep labour figures at the minimum, two things should be taken into consideration : unnecessary employment and labour wastage. Since time cycles on various operations are frequently unknown before production starts, the tendency exists to put one operator on each job, thinking that " things straighten themselves out " in time and that several jobs can be combined at a later date.

Arrangements of this nature usually cause trouble. Intentionally or unintentionally, employees adjust the speed of their work according to the work assigned to them ; attempts by management to eliminate waiting periods, or to increase the speed of work after an employee has got used to his job, are often

resented. At the start of a production run it is better to assign more work to individuals than they can handle, because employees then have a goal to strive for. Furthermore, some operations can be simplified to a greater extent than was originally expected, and employees who cannot handle the job completely can be given assistance by other employees whose time is not fully utilized.

Start-and-stop waste should be reduced as much as possible. This means that everyone will have to be familiar with his duties before production starts. Management will have to see to it that all employees are supplied with the necsesary tools, so that no time is wasted in hunting for wrenches, thermometers, etc. Sufficient spare equipment should be available to prevent interruptions which might affect the entire production.

Clean-up operations should be carefully planned. Labour costs are often above normal despite properly laid out productive operations because the time factor for cleaning has not been given sufficient consideration, and operators are allowed to determine the degree of cleanliness to be achieved and the time it takes to get equipment ready for the next batch. It is important to keep the working crew busy until closing down time.

The fact that an operation cycle is completed half an hour before the end of the working day does not mean that everybody can take it easy. There are usually a number of tasks which can be performed for the following shift or for the next day's work. " Stop " labour wastage in industry constitutes a great percentage of unproductive time which can be eliminated without much effort.

Steel-to-Glass sealing

A new process, based on a well-known principle is now in commercial use for sealing-in radio valve parts.

SUCCESSFUL joining of glass to ordinary steel to effect a permanent union is very desirable in a number of lines of industry but has presented a problem that until recently defied solution. The secret of a new process developed for joining steel to glass is based on the principle that glass is a solvent for oxides. Hitherto, too little oxide on the steel prevented adhesion of the glass and too much oxidation left a porous interface between the two materials.

This difficulty has been overcome by the procedure adopted for making a permanent air-tight seal for metal electron tubes which permit use of a stable metal instead of special alloys that are more costly and sometimes scarce. The process also allows a mechanical design whereby strains created in the glass-metal boundary by differences in expansion of the two materials are compensated.

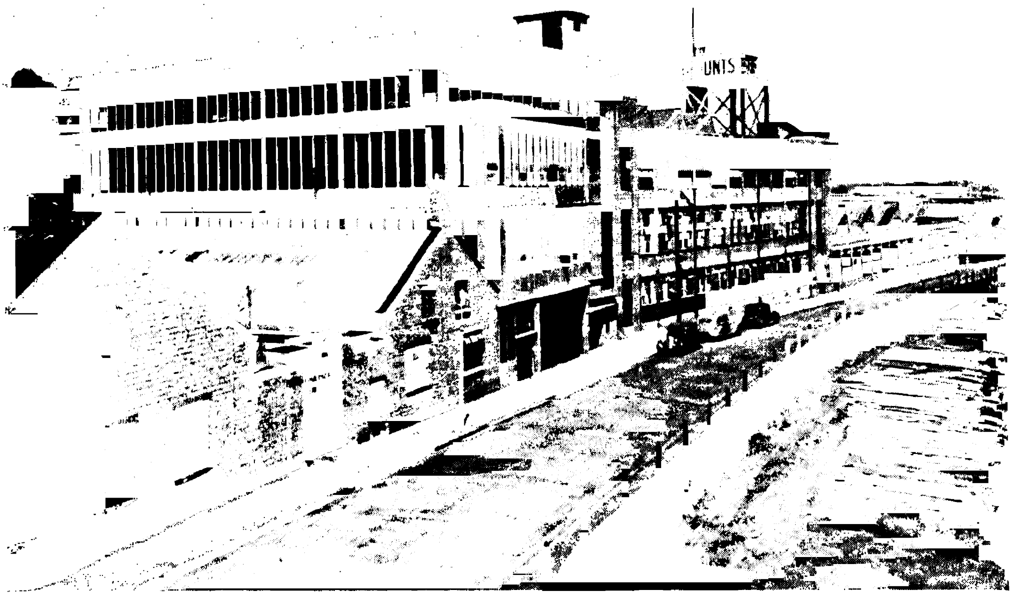
Surfaces sealed by the new method are the outer edge of a glass disc and the inside of a metal band known as the header insert. The glass button insulates the wire leads which connect internal elements of the tube with plug-in pins on the base. The header insert joins the button to a ring of steel called the header, which, with the button, forms the " floor " of the tube and is welded to the open end of the metal envelope to support the internal structure and complete the enclosure.

Intense heat is applied to the outside of the oxidised steel header insert band by fine jets of gas flame, and the glass button, softened by heat, is pressed inside the band. Any excess of oxides then dissolves into the softened glass and an air-tight seal is produced.

Extensive experiments were necessary to determine the most suitable grades of glass and steel, the most effective fusing temperatures, and procedure which could be controlled adequately. The method developed is being applied with excellent results in present production of radio valves.

Introduction of the glass-button stem construction in 1938, with all the wire leads passing through the single insulator, made possible the substitution of two pieces for the collection of 13 to 17 which had been used in valves of most types. At that time, glass could be fused satisfactorily only with a special alloy of iron, nickel and cobalt, so it was necessary to weld to the stem a separate eyelet of this alloy as a holder for each of the glass insulators.

When the glass-button stem was first adopted, a header insert of chrome iron was used, but when war threatened a shortage of chromium, the engineers began searching for a means of fusing the glass to a more staple and available metal.



To be perfectly truthful the visit to Hunt Partners factory on which this article is based was not our own idea. To our shame it must be admitted that, when we had been considering various products and firms for this feature, we had overlooked that humble yet indispensable object—the cardboard box.

Whilst it does not excuse us we can, however, plead that we are not alone in having overlooked the boxmaking industry. Others, including our own Government, have been guilty of this in the past. We seem to recall an occasion during the fuel crisis last year when certain " essential " food factories had to stop because officialdom had decided that boxes were " not essential."

As we said, it was not our idea but, once it was suggested to us we couldn't help but wonder why on earth we ourselves hadn't thought of it before.

Having decided to rectify the omission we found ourselves a few weeks ago, in the office of Mr. Percy Hunt at the firm's factory in Clapton. We chose Hunt Partners as a suitable firm for our purpose for two main reasons :— First, because they rank among the leaders of the packaging industry, and, second, because they are a family concern with a tradition of personal and individualistic service.

The story which Percy Hunt told us that morning in his office was a story of industry and enterprise that had its beginning way back in 1872 when the firm's founder put up his sign " Thomas Hunt—Boxmaker and Printer" at the back of No. 7 King Henry's Walk where he had his residence.

In 1894 Thomas Hunt was joined by his son Mr. Archibald Hunt and, five years later, by his other son Mr. Rowland. These two, incidentally, became known to everyone as " Mr. Arch " and " Mr. Rowl ". They started work each day at 8 a.m. and closing time for them was any time between 8 p.m. and midnight.

Delving back into the memories of the past Mr. Hunt told us how, in 1896, the only traveller in the firm fell off a tram whilst drunk and broke his leg, and this necessitated Mr. Arch calling on the customers ; from that time his interest was mainly concerned with Sales, whilst Mr. Rowl, put all his energies into the factory. This proved an admirable arrangement, and continued for nearly 50 years. In fact it persists even today as their descendants are still carrying on the tradition.

We pressed our host to tell us more of the early struggles and growth of the firm and, once he had started, we drew from him a wealth of fact and anecdote that both surprised and impressed us.

This first factory, according to our host, was a two storey building with its ground

INTERESTING ENTERPRISES No. 19

BOXMAKING

Like many other family businesses, Hunt Partners Ltd., started modestly in a small workshop staffed by less than a dozen skilled hands. From that early commencement in 1872, son has succeeded father in the business and at present the third generation with a working staff of many hundreds around them remain to uphold the traditions of sound workmanship, honest trading and willing service established by the founder. This article sets out to tell of the growth and development of this firm; recognised as specialists in folding and rigid containers for nearly 76 years.

floor in more or less permanent gloom, lit only by a flickering gas light and here was situated the incinerator, gas engine—the power of those days—and all the stock of cardboard stored in racks.

" These racks," said Mr. Percy, "provided ideal hiding places for the grandchildren, and there they used to hide to tickle the ankles of the girls as they made their way home. The resultant shrieks from the girls greatly delighted them."

" The gas engine was hardly big enough to run the few machines in the factory, and had to be carefully nursed. Mr. Rowl tended this engine as if it were a baby. In the yard was a two wheel cart and this had the unhappy knack of tipping up if the children climbed inside. They would then be trapped and absolutely unable to get out until someone came to the rescue.

Getting back to the growth of the business; Thomas Hunt had decided views against the use of machines, and could not be induced to give his consent to the purchase of any. As his signature was the only one permitted on a cheque, something unorthodox had to be done. Mr. Arch had a brainwave. He asked a customer to pay his account in cash instead of the usual cheque, and with the money a rotary cutter was purchased. In spite of all Thomas Hunt said when he saw it—and we are assured that his words could not be printed here—the machine stayed, and was the forerunner of many.

In 1907 their first branch was opened—at 10a King Henry's Walk, opposite the main factory and a forewoman was put in charge for the princely salary of 16/- per week. She had under her charge four boxmakers, four wire-stitchers, four packers and approximately 30 outdoor workers. The girls worked for $2\frac{3}{4}$d. per hour! This branch, our host informed us, was heated by an old slow combustion stove with a stack pipe, which smoked so badly when it was lit that everybody had to go outside into the open until the smoke cleared away.

In 1911 the first big milestone was reached by Mr. Arch and Mr. Rowl when they themselves rented a factory in Dalston Lane. Mr. Thomas Hunt did not agree with the extension and would have nothing to do with it. Dalston Lane was the birthplace of the printing and folding-box departments.

King Henry's Walk was by this time being worked to capacity and during the war years of 1914-18 two new branches were opened, one at Englefield Road and the other at Hertford Road. At the former the handworkers on rigid boxes were installed on the ground floor

and a new innovation, a travelling glue-band, was set up on the second floor for the banding operations.

About 30 outdoor workers were controlled from this centre but when Hertford Road factory was taken over these outdoor workers and the hand-workers were put under one roof.

The first world war, 1914-18, saw the purchase of more machines to cope with Government contracts for ammunition boxes, and as considerable expansion took place in this period it was felt that some degree of centralisation should be attempted. Accordingly, a much larger factory was rented at Shacklewell Lane and the offices moved to the new factory. At the same time the present land at Theydon Road was purchased with a view to immediate development in the shape of a reinforced-concrete three-storey building housing all the activities of the firm.

Alas for hopes ! Theydon Road site proved to be a white elephant right at the start. Plans were approved and whilst at that time no fixed prices for building were quoted the Brothers were given an idea for the cost of their new factory as approximately £19,000.

Right at the outset, however, it was discovered that the portion of land on which foundations were commenced was nothing but an old dump and the whole of the original sum was spent on laying these concrete foundations and the piers for the first floor. The firm was, in those days, unable to withstand such a blow and the building was halted and a watchman put in charge to tend the gaunt spectres of the piers which thrust their fingers to the sky—ghosts of the hopes of Mr. Arch and Mr. Rowl !

However, after a few very hard and lean years, the piers were put to their original use and clothed in concrete. This factory was of three storeys and 30,000 sq. ft. floor area ; all the branch factories were moved in.

The efforts of the Sales Department soon proved that even the increased space at Theydon Road was going to be inadequate. In 1933, therefore, a single storey building was erected along one side to give additional space. This growth made them realise all the more the advantages to be gained if they could design and make their own machines, import cardboard direct from abroad and make their own printing plates and steros.

Plans were made accordingly, and in due course a wharf on the riverside was erected, where barges were unloaded from the River Lea having come direct from the docks. Extra buildings at the rear of the main premises housed the stereo shop and stores.

In 1936 an opportunity was seized to purchase the adjoining premises known as Clarke's Foundry, and this was converted into a suitable shop for the Engineers. Fortunately, the acquisition included a piece of land which enabled the Directors to build the present fine four-storey building which was completed in September 1939.

Having heard this account of the firm's growth and progress we asked Mr. Hunt to tell us something of the products and processes of boxmaking, and he gave us some surprises. Just before the war, we were told, the output of one particular department alone was estimated at no less than 200,000,000 boxes per year—more than enough to send every man, woman and child in the British Isles, 4 times a year, a present packed in a

Hunt Partners' Box ! In fact, most of their regular customers took daily deliveries and almost regarded the firm as one department of their own works.

" Such figures," said our host, " can obviously only be obtained by a high degree of specialisation, a close knowledge of mass-production problems and an exceptional variety and range of machines. We claim to have kept abreast of, if not ahead, of every other boxmaker in the country."

The result is that the firm can now claim to be specialists in the mass production of rigid wire-stitched and folding boxes of every type. This specialisation takes the form of applying certain methods of production designed to make possible the production of large orders promptly at competitive prices, with particular regard for the speciality of printing. This is a prescription which sounds both simple and commonplace, although its fulfilment is, in fact, the outcome of considerable research and careful planning.

In company with our host we set off to see for ourselves just how this prescription is dispensed in practice. First, we visited the rigid box section and watched girls with deft fingers glueing, assembling and smoothing cover paper into film pack and X-ray plate boxes. We did not try it but we felt certain that, had we done so, we should have made a very sticky mess of the job.

We watched machines of every type, some applying corner strips to rigid boxes, some wire stitching boxes, others bending, shaping, glueing and performing other amazing functions with rythmic regularity.

It is indeed fascinating to watch machines, their mechanical fingers working with far greater precision and at thirty times the speed of the most expert human hand, shaping, glueing and covering cardboard boxes and similar containers.

Another fascinating sight is the reel-fed machinery on which boxes are cut and printed in one operation, every box having the exactitude of an engineering job, with no variation, however long the run. This method requires special dies of solid metal, which are made by the firm.

The better to appreciate the degree of mass production by which the cartons are turned out, it is advisable to examine this process in some detail. Its salient features can best be understood by contrast with the orthodox flat-bed principle, which Hunt Partners also use extensively.

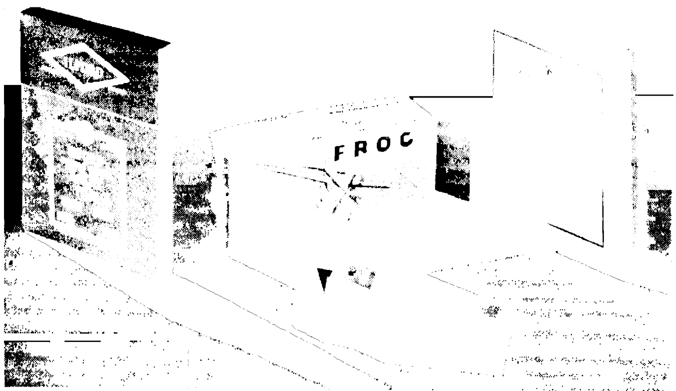
In the latter method the cutting die is made for any number of cartons, depending on the size, and the appearance is rather similar to a jigsaw puzzle. Various wood patterns are cut to the required shapes, and the cutting and creasing blades are inserted between them where required. When assembled the die is locked up in a " chase "—an iron frame—which then is placed in position in the bed of a large cutting machine.

The sheets are cut and creased by a process similar to that by which paper and cardboard are printed. The process is automatic. The sheets are placed in a stack at the feed end and the top sheet is taken up by a series of suckers. As each sheet is taken the feed pile rises fractionally to keep the top sheet at the same level. Grippers then take hold of the board, which is fed through the machine and delivered at the other end automatically stacked. The reverse principle applies here, in that the delivery

Battery of Stokes & mith wrapping machines r rigid boxes.

Part of one of the printing machine rooms for labels and cover papers.

A view taken in the hand boxmaking department, making rigid boxes.



Famous names : firms who have their boxes made by Hunt Partners. Another group appears across the foot of pages 60 and 61.

board drops slightly as the boards are put one on top of the other.

The preparation work on a flat bed machine is interesting. The die is put in the bed and on the large cylinder which takes the board round is placed a specially prepared sheet, so cut out that slots cut in it exactly fit the knives at the point of contact, causing a correct cut or crease as desired. To ensure that the board will come away with the die cork discs are inserted at a height greater than the knives. These corks are compressed each time during the process of cutting, but spring up again when the pressure is removed. As the cork resumes its former position so the board is automatically stripped or cleared away from the knives.

The sheets have then to be broken up, to separate the various cartons, by the process known as stripping, which is usually carried out by hand. Then the small pieces of scrap board are taken away and the rough edges of the cartons are, if necessary, filed.

In the reel-feed method utilised extensively by Hunt Partners a solid steel die takes the place of the wood die. This cutting die is

[illegible] of the carton cutting, folding and [illegible] department.

This photograph gives an idea of the size of the packing department.

The machines seen in this illustration are used for banding rigid boxes.

prepared in the engineering department, and when it has been given the correct surface and diameter for the job the surface is "profiled."

This means that a plan of the box or carton to be made is marked out on the steel, which then passes to a toolmaker whose task it is to convert it into a cutting die. This may take him four or five weeks. He drills away, by hand and by machine, various parts of the die until only those portions which are to cut or to crease remain at the original height.

These portions are then finally shaped, prepared, sharpened, and according to the purpose for which they are required and the whole die goes through a process of hardening. By the time it leaves the engineering shop it may have been in production for many weeks, but it will be exact to a thousandth of an inch, and every box produced from it will be the same. Hence it can easily be seen how necessary it became, on account of both time and accuracy, to have these complicated tools made on the spot under the trained eye of the firm's own engineering staff.

The die does its work on a machine specially designed to cut boxes from the reel and the apparatus includes a number of Hunt Partners own unusual gadgets, adaptations and special fittings.

When running off the boxes one or more colours are usually printed before cutting. The small pieces are stripped off automatically by the machine, and the boxes—printed, cut and ready for despatch (unless they are to be glued)—are delivered at the far end of the machine. Three or more different operations are thus merged into one by this method at a very high speed.

If boxes have to be glued after passing through the printing and cutting operations the flat cut-out cartons are taken to an automatic glueing machine which works at an astonishing speed as we saw when we watched one being started up on a run of small cartons for gum containers.

A stack of cartons is fed into the machine at one end. The machine picks them up from the bottom, one at a time, at a speed of anything up to 30,000 an hour, glues them along the side edges where the join is to be, folds them over and delivers them, counted in batches of 100, at the other end.

Whilst we would like to have lingered in the machine rooms and watched the flying ribbons of card disappearing into the machines to emerge again as complete collapsed boxes, time, however, would not permit, and, somewhat reluctantly, we passed on to the engineering shop.

Here our host pointed out several of the rotary box cutting dies we had seen in use. They were here seen in various stages of preparation. We also noticed that a number of special purpose machines were standing about in course of erection or overhaul. A query brought out the amazing information that most of these unusual machines are specially built for the job by the engineering section !

This is a feature that has contributed, in no small measure, to Hunt Partners' success. The firm's principal contracts running into millions of cartons a week, have been secured, it is claimed, invariably by the personal application of ideas, even if it meant building a special machine backed up by a properly correlated organisation.

So, from the modest workshop of 1872 has grown the present extensive organisation specialising in the designing and producing of folding and rigid boxes for any and every trade by every modern method. But the old spirit of willing service is as active today as when the foundations of the firm were laid. Specialisation and mass-production have certainly brought down the price and improved the quality for the carton user—but personal service alone has ensured the friendly and satisfactory relations that Hunt Partners have always established and maintained with clients old and new alike.

MISCELLANY

IMPORT OF MACHINERY FREE OF DUTY

UNDER Section 10 of the Finance Act, 1932, as amended, the Treasury are empowered after consultation with the Board of Trade, to license the duty-free importation of machinery. It is a statutory requirement that application for the issue of a licence under the Section should be made before the machinery is imported.

Cases continually arise, we are informed, in which application is made for a Treasury licence *after* the consignment of machinery has reached the United Kingdom. Whatever the merits of the case for duty-free importation, it is not possible under the statutory provisions for a Treasury licence to be granted in such circumstances.

The B.O.T. ask us to emphasise that, in the case of any machinery which it is desired to import free of duty, it is essential, in order that the application for exemption from duty may be considered, that the application for such exemption should be made before the machinery reaches United Kingdom. The application, they say, can then be considered on its merits.

ADVICE ON PACKAGING FOR EXPORT TRADE

APPROPRIATE packaging is important to the export trade and necessitates heavy claims on supplies of steel, timber, paper, board, glass and textiles. With a view to determining and giving effect to the priority required, the Federation of British Industries, under its Overseas Policy Committee, has set up a special committee on packaging under the chairmanship of Mr. John Ryan, vice-chairman of The Metal Box Co., Ltd., to ensure that difficulties are minimised. There are, also, problems regarding the packages appropriate for individual markets and climatic conditions to be experienced. The Packaging Industry Committee of the British Standards Institution are revising the Packaging Manual, produced during the war, to bring it into line with wider requirements; its supplement on packaging for tropical areas is highly informative on this subject. Both these publications can be obtained from the British Standards Institution, 24-28, Victoria Street, London, S.W.1.

INSTITUTION OF WORKS MANAGERS—NEW AWARDS

FOUR scholarships tenable at Cheshunt College, Cambridge, are to be awarded by the Institution of Works Managers on the basis of essays for which one of six subjects enumerated has had to be chosen. The essays were due to be sent in at the beginning of February. They cover such subjects as the economic crisis and the problem of the small firm in relation to the problem for greater production. The scholarships are tenable for eight weeks and students may attend university lecture courses that bear upon their studies. The age limit for contestants for these scholarships is 35 and the object is to enable men who hold responsible positions, or are in training for them, to relate their technical training to a wider outlook. For younger men (age limit 25) the Institution are awarding three bursarships at the Y.M.C.A. College for Adults at Broadstairs. The bursarships, tenable for one month are also awarded on the basis of essays, in this case relating principally to personal outlook. For both cases the Institution reimburse successful applicants for any loss of wages as a result of absence from work.

NATIONAL SAVINGS AS A FUNCTION OF MANAGEMENT

ORIGINAL views about the value of a National Savings Group in an industrial organisation are held by Mr. John Oldham, O.B.E., J.P., Chairman and Joint Managing Director of Oldham & Son Ltd., Denton, Manchester, leading manufacturers of mines' lighting equipment, electric storage batteries and hatting machinery.

Mr. Oldham, who is the Chairman of Constituency 16 of the North West Region, believes that National Savings is a function of management and that participation gives a

man or woman a sense of security inspired by having something in reserve, a higher sense of personal responsibility and a greater interest in national affairs. A person with these qualities is likely to be a good and responsible worker and his value to industry is increased, alleges Mr. Oldham. He further believes that a spirit of co-operation and mutual understanding is fostered between management and labour by Savings Group organisational work—personnel meet on the committees as individuals and not as seniors and subordinates and have opportunities beyond those which are normally possible in an industrial concern of knowing and liking each other.

Mr. Oldham substantiates his claim by recounting the history of his firm's industrial savings group, established nearly five years ago. Oldham & Son Ltd., which became a Public Company last year, employ about 1,200 workers and more than three quarters of this number are Group members. The total savings of the Group per week are £300 or an average of 6s. 5d. per head. This in itself is a remarkable achievement but Mr. Oldham says that the monetary addition to the nation's coffers is not so important as the impetus which has been given to the production drive by the two-fold advantage described above.

In times of labour unrest, strikes and other hold-ups caused by disputes between management and labour, Oldham & Son reach and beat their output targets in a friendly, well-balanced atmosphere.

HEAVY DEMAND FOR SPACE AT B.I.F.

The demand for space at the 1948 British Industries Fair has been exceptionally heavy and both the London and Birmingham Sections now have a waiting list of late applicants.

Total space applied for to date in the London Section is 684,000 sq. ft., which compares with the total area of 531,000 sq. ft. available at the last Fair. That figure, however, will show a slight increase in 1948 due to an alteration in the space devoted to display features and in the re-arrangement of gangways at Earls Court. Despite this and a cut of about 20 per cent. in the space asked for by accepted applicants, it has been necessary to place over 200 late applicants requiring over 47,500 sq. ft. on a waiting list.

There will be over 3,000 exhibitors representing at least 87 United Kingdom industries at the Fair in London and Birmingham.

BRITISH STANDARD FOR HEAT TREATMENT

The British Standards Institution has recently published a British Standard for Terms and definitions relating to heat treatment of steel, B.S. 1392.

This British Standard includes a list of terms in general use throughout the steel industries relating to the heat treatment of steel, and the definitions of these terms are specified. An Appendix gives further details of the transformation ranges.

Copies can be obtained from the Offices of the British Standards Institution, Sales Department, 24, Victoria Street, London, S.W.1., at a cost of 2/- post free.

MASS-PRODUCED RAMIE

A new kind of machine using previously untried principles for the simultaneous rapid harvesting and decorticating of ramie is being shipped to the Florida Everglades, the principal U.S. ramie area, for field trials by Sea Island Mills Inc., which developed the 15 ton device. The machine is designed to strip the fires from ramie stalks at the rate of 15 acres in an eight-hour day, and it is claimed that fibre recovery will be almost complete as compared with the 20 to 30 per cent. waste with other units. Commercial mass production of ramie, it is pointed out, depends on a practical, fast machine for removing the ramie fibres from the raw plant in such a condition that they may be readily degummed and spun on conventional machinery.

NEW DATA BOOK

The Mond Nickel Company Limited have recently issued a publication which will be of considerable value as a book of reference for the use of the foundry trades, and, indeed, to every engineer concerned with cast iron. The "Nickel Cast Iron Data Book" is a revised and amplified edition of a similar book, first produced in 1939. This was in great demand during the war, even in its abbreviated form, and it is felt the new publication, as a loose-leaf pocket edition, will be equally sought after. As will be known to holders of the earlier edition, it contains a mass of information on technique, cupola practice, weights of charges and, in fact, every aspect of the founding of the many types of nickel alloy cast iron now in use for engineering construction.

MAINTENANCE DEPARTMENT

BY H. M. HARMAN

ONE of the primary considerations when laying out a maintenance system is whether or not the department will handle all the repairs, breakdowns, servicing, overhauls and so on.

Dealing first with the buildings. Most large factories carry their own building department, but on the other hand some do not think it worth while. The pros and cons are soon disposed of. If you have your own bricklayers and carpenters then you wait for no man. If you want to turn the factory inside out then you get right on with the job. You save the profit which would go to the building contractor and you save expensive delays. Also you are not bothered with " foreigners " hanging around the production plant.

Looking at it from another angle you perhaps do not anticipate having sufficient work to keep a building department going week in and week out.

The problem is one which only you can decide, but from my experience I should say that a factory employing say 2,000 operators can afford to carry a building department consisting of one bricklayer and mate, 2 carpenters and 2 improvers, 1 general builder for drains, gutters and roofs. And two painters.

The plumbing could be done by the millwright's pipefitter. With a gang of this size normal repair work and routine maintenance can be carried out by the staff, but any major alterations would necessitate the calling in of a contractor.

Inside or out ?

With machine tool maintenance and mechanical repairs a similar decision must be reached. " Are you going to do your own repair jobs or do you propose sending for outside help. Here again let's take a 2,000 operator factory with about 500 machine tools.

You will need about 4 millwrights with mates to do the normal maintenance and machine installation, and two pipefitters and 4 electricians for services.

They will not have time for routine jobs, installation work *and* major overhauls, therefore when a machine is scheduled for stripping down and reconditioning it will have to go back to the maker.

" Swinging the lead "

There are of course sound reasons for not doing your own overhauls. (a) A reconditioning job is ideal for a man who wants to "swing the lead " it is very difficult to assess what is a good day's work on a job of this nature therefore you'll pay nearly as much for supervision as you will for the job.

The maker of course doesn't work under this handicap. No ! He's done the job before. His " Supers " know just how long it should take.

Further to this, if you send the machine out you relieve yourself of the necessity of ordering and carrying spares and you save the space that would be taken up by the reconditioning department.

Now consider the other point of view. With a shop of 500 machines all of varying type and vintage it can be agreed right away that reckoning an average period of 5 years between overhauls you will have 100 machines to recondition each year, or two a week.

That will occupy at least 3 men, probably 5, at a cost of roughly £2,000 per year for labour and consumable material. Add to this say £1,000 for replacement parts and the resultant £3,000 will probably compare very favourably with the makers bill for reconditioning 100 machines. Here again the decision rests with you.

The installation of an arc welding set is really essential these days. Think for a moment of the jobs which a proficient arc welder can do for you. He will repair cracked or broken bed castings, build up worn shafts, fabricate bench legs, stands, racks and what have you.

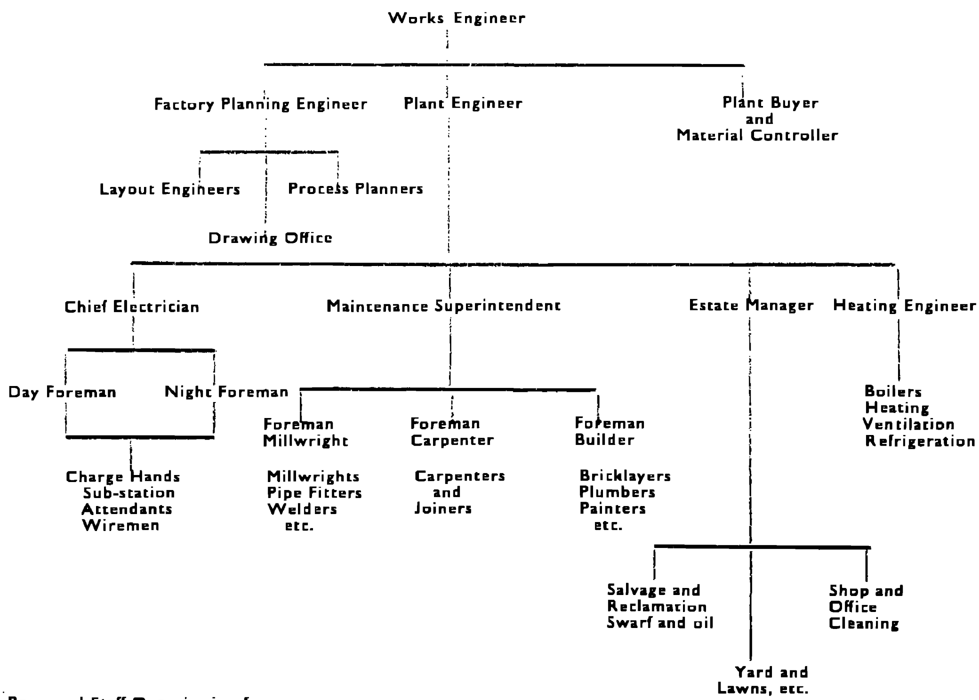
If he is versatile and can do large and small jobs he will find plenty of work making new structural steelwork and tanks and repairing road vehicles. Welding is one job which I do not recommend you to send outside. If you do, the inclination will always be there to try and do the job some other way so that you can keep it in the shop.

Instead of fabricating the roof trusses for that shed or welding a broken frame you will be messing about for days drilling holes and fitting fish plates.

What about your paint work ? Here is a job that all too often gets pushed into the background. Too many people have the misguided idea that paint is put on the outside of a building to make it look clean and pretty. It is ! But that is not the primary function. First and foremost it must protect the building from the weather, after that it can look nice. A firm which employs its own painter will always look spick and span and the woodwork will be kept in good shape because the man can keep going around the job and getting things done. If a firm of contractors have to be fetched in, then delay will occur while quotations are being obtained and again while your name is on the waiting list. In the end you'll dread the thought of having to bother with redecoration until you'll let it slide one or two years. When you're replacing the timber which has crumbled away with dry rot you'll decide that to employ your own painter is perhaps the best way out after all.

The individual chosen for the job should include in his achievements the ability to do signwriting. This is a thing which is always cropping up in any factory and should be adequately covered.

With the electrical side of the job similar problems also have to be considered. Will you do your own wiring and motor rewinds ? You will obviously reckon to wire up new plant or odd lights and clocks, but will you wish to keep a gang on the strength for carrying out major installations ? The answer to this one depends mainly on the type of



Proposed Staff Organisation for Works Engineer's Department of Large Factory.

factory, and the policy of the company must be studied very carefully before finalising on the problem.

A plant which runs for a year and then changes over to new methods, systems and products, will require to carry out their own work to the almost entire exclusion of outside contractors, otherwise they will never reach installation or production schedules, but a factory which is laid out to a plan for producing say men's suits will not need to vary its layout once in 10 years and any expansion will probably be very gradual. This firm would hardly need a new shop putting up overnight, therefore one or two all-round electricians for maintenance would satisfy. Major jobs, if any, could be subcontracted.

Routine maintenance such as belt care, oiling and greasing, cleaning, etc., can be either carried out under the supervision of the production department or it can be the responsibility of the maintenance section.

Some companies allow the machine shop operators to oil and clean their own machines, indeed they encourage it by allowing a quarter of an hour at the end of the Saturday morning shift for this especial purpose.

This in my opinion is all wrong. At the end of the week the average operator is sick of the sight of his machine, he wants to get away for the week-end and forget about it. The last half-hour of the Saturday morning shift will be a slack time in most shops for this reason. Therefore why expect a man to conscientiously clean and oil his machine just at the psychologically wrong moment. Indeed why expect him to do it at all ? Here are two reasons :

(a) If he is a highly skilled operator who has sufficient intelligence to realise that the machine will not work for ever without being maintained, then you're paying him far too high a rate for doing an intelligent labourer's job.

(b) If his rate is low then you can rest assured that he is not sufficiently interested to do the job of oiling and cleaning efficiently, therefore he's wasting his time and ruining your machine.

To overcome this, sort out an " intelligent labourer " and make him responsible for so many machines. I appreciate that the term " intelligent labourer " is rather a contradiction of terms because normally if a man is intelligent he will not be a labourer for long, but it is possible to find someone in the usual labouring gang who will be only too ready to earn a few more pence per hour by making a success of a straightforward routine job which calls for a little bit more care than pushing a broom.

The next thing to decide is " who will this man work for." I say let him work under the plant department. You pay the production personnel to produce and the maintenance men to maintain, therefore—let each man to his job.

So with the other jobs. Machine tool overhaul and repair and installation work. These must all come within the scope of the Works Engineer if they are to be done efficiently and economically.

As a guide to the set up for a maintenance section Fig. 1 shows a " family tree " for this department.

Personnel

The choosing and hiring of personnel for maintenance work must be studied carefully. A good millwright is a man who has had a mechanical training, considerable experience of slinging and good all round machine shop practice.

In addition to this he must be willing to change his ideas for more advanced theories, he must be sufficiently versatile to be able to go from a small delicate job to the moving of a 100 ton machine and back again without needing a " rehabilitation period " in between, he must be able to accept orders and to give them and finally and perhaps most important of all he should have a sense of humour.

This may sound to you a peculiar trait for an efficient millwright. But look at the job from his angle.

The Managing Director has a conference. " We are not getting sufficient X units per week," says he. " How can we step up production ? "

Up stands the Works Superintendent in the Machine Shop. " I must have another No. 12 Turret Lathe right away to enable me to get my output."

" O.K. ! " said the M.D. " where do we get one and where do we put it ? "

Here the plant layout engineer has a go. "I have a lathe in No. 4 shop which could be replaced by a smaller machine and then by doing so and so, and so and so, we can get the new machine in." This probably goes on for hours. What does the millwright know ? Only that " those blokes up there have decided that they want to move half the shop round again and I'm the poor unfortunate who's got to do it." He doesn't know why he's doing it. Life is too short to tell everybody

everything, therefore he must bring his sense of humour into play and adopt the attitude that gets the job done quickly and well regardless of the fact that he might think the whole scheme crazy.

An essential requirement when choosing any type of maintenance man is that he is prepared to have his time off to suit you and not to suit himself. Therefore try and find men who have flexible hobbies like gardening which do not have to adhere to an hourly timetable.

Short cuts in maintenance

With a little thought, much time, worry, labour and money can be saved on maintenance work and the few hints given may be new to some of my readers.

When pipefitting ensure that the plumber uses a sealing compound for compressed air, gas and water which will not set hard. The object of a sealing compound is to lubricate the pipe threads and to prevent escape of contents. This can be achieved without using a solution which when dry sets like granite and necessitates the use of a hammer and chisel for breaking the joint. "Hermatite" is a compound which satisfies these requirements.

For bolting down machine tools and similar pieces see that the millwright uses Rawlbolts or Philbolts. When the planning engineer decides to move the machine later on it can be taken out in a matter of minutes leaving the floor undamaged and perfectly clear of obstructions.

Many machines are incorrectly motored. Some have motors with too high a H.P. Some too low. Get your electrician to study his plant and if a large batch of machines of the same type are in use it may be worth while to experiment with various different sizes.

A motor which is too low in H.P. will cause endless trouble due to overloading and belt slip under load. A motor rated too high will be wasteful on current.

A library in the Works Engineer's office should be prepared and kept up to date. Don't include the latest thriller, but do include all available handbooks, working drawings, foundation plans, spare parts sheets and so on for all your plant. You will reap the benefit the first time a machine breaks down.

When taking a machine out of commission have machine tool fitter check it over. Any minor repairs should be done right away. The machine, including the suds system, should be well cleaned. Oil all bright parts and label any connections which may be obscure.

The millwright who has the job of putting into commission at some future date will thank you and your repairs account will prove to you the value of this good housekeeping. A machine stored away in a dirty condition will deteriorate very rapidly.

If you are continually changing your plant layout due to the exigencies of production use partitioning for offices and stores which will stand moving. Timber is hopeless. Steel is the only sensible materials and the design of this should be studied carefully. Insist on standard size panels, uprights, doors and windows and when the floor plans of a new layout are prepared make sure that the partitions as required by the plant layout engineer are obtainable from standard sizes. If he wants a store 20 ft. 0 in. long and your standard panel is 3 ft. 0 in. a few words of explanation may save you the trouble of making filler panels.

Mechanical equipment

An air operated hammer of the "Kango" type will save its cost in the first 2 or 3 months. There are so many jobs which can be done quicker and better with this type of tool than with the old-fashioned hammer and chisel. Removal of old paint from steelwork, descaling punching holes in concrete floors and brick walls, tamping concrete in pre-forms are only a few of the uses.

For moving plant from one place to another the "Yale" type plant truck is invaluable. This is not illustrated as it is too familiar these days. With its use machines can be moved in about a tenth of the time taken with the old roller and pinch bar method.

Before closing the subject of maintenance department methods I would like to recommen to anyone with a large machine shop that they instal a maintenance crew in the shop itself. Let the crew consist of millwright and mate, and electrician and mate.

They can be located centrally in the shop and should be on instant call for dealing with easily overcome breakdowns. If they are available as suggested it will save production time and it will eliminate the possibility of unauthorised persons doing their own repairs. Minor electrical repairs are very tempting to an operator who thinks he's a bit of a handy man. But if he tries to repair a faulty connection while the power is on and he's standing on a wet floor. Then in the current parlance "He's had it !"

Books

Welding of Plastics. By G. Haim and H. P. Zade. *Crosby Lockwood & Son Ltd.* 21/-. 206 *pp.*

" The Welding of Plastics " is about the first book in this country to be exclusively devoted to this subject. The authors of this work, who have had considerable experience originally in the welding of metals and subsequently in the welding of plastics, have successfully combined their own experiences with the isolated literature on the subject which has so far appeared. The book can be recommended to all those who are likely to need to fabricate plastics in any way. It should be stressed that this not only applies to those who manufacture articles from plastics but also to those who are likely to have to effect any repairs in plastics articles which they may have. Examples of this are the joining of pipes used to convey corrosive liquids, etc., and repair of torn tank linings from sheet and the like. All the known types of welding which may be applied to plastics are described, including hot gas, heated tool, high frequency and other miscellaneous methods. Full details of procedure are given in clear style.

Suggestions for improvements are that more space should be devoted to the thermal and mechanical properties of the plastics rather than the chemistry of the subject. The latter has been well covered in other books and, as described by the authors, is too simple for the expert on plastics and too complicated for the beginner.

The section on the identification scheme for plastics should be elongated since those requiring to weld need to know in many cases the exact composition of the plastic which they will be welding. In the scheme given, the fact that the various plastics will contain plasticisers and other ingredients is ignored, and most modern plastics do contain modifiers of some type. However, in general, the book will be a valuable addition to any library and extremely useful to both specialists in either fields of plastics and those who know nothing about this subject whatsoever.

SCRAP 27,000 TONS
WASTE NIL

THAT, roughly, is the story of the scrap material issuing each year from the Austin Motor Company's Work at Longbridge, Birmingham.

The scrap steel from stampings and borings made into ⅛ in. x 1 in. strip would more than encircle the world at the equator. An even greater length of ⅛ in. wire could be made from the scrap yellow metals such as brass and phosphor bronze, the weight of whose scrap each year exceeds the weight of a modern locomotive. But none of this valuable material is wasted. Back it goes into the Austin blast furnaces for re-smelting into ingots.

The scrap aluminium and light alloys would suffice to build 58 Prefab Aluminium houses —but this, too, is reclaimed for automobile construction; while the amount of oil reclaimed every week, if it were diesel oil, would be enough to run a double-decker 'bus five times the distance from London to Tokyo.

In the course of a year, many tons of scrap leather leave the factory—but almost the whole of this finds its way into the manufacture of boots and shoes—any of the leather unsuitable for this purpose being finally absorbed in making artificial fertilisers.

Head-cloth and calico, like carpet-felt, aggregate only about 10 tons of scrap each year, but all these have a considerable industrial value. The former are in great demand for the export market which takes them in the form of (of all things) incubator curtains, while some also goes to the glove trade for gauntlet linings and very small pieces, free from foreign matter, go into the making of paper. Carpet material is graded for size, the large pieces being used by a variety of trades, particularly in the manufacture of Toys, Hassocks, Polishing pads and the inner soles of slippers. Of the smaller pieces, those suitable for pulling for felt go back into motor car factories in that form.

In twelve months some 150 tons of scrap timber are taken away from the Longbridge Works to be converted into fire-wood, while anything up to 80 tons of waste paper are returned for re-pulping.

The strictest segregation is carried out before disposal, to ensure that all material suitable for re-use is retained, stored and re-issued to the staff responsible for the maintenance of plant. Had it not been for the care with which this selective work is done, the staff concerned undoubtedly would have had great difficulty in meeting their commitments.

Forthcoming

M.O.S. AUCTION SALES

Date.	*Site of Sale.*	*Auctioneer.*
	Miscellaneous Stores.	
March 1st to March 5th.	R.A.F. M.U. 263, Stansted, Mountfitchet, Essex.	Sworder & Sons, 15, North Street, Bishops Stortford. Tel. : Bishops Stortford 692/3.
March 3rd.	Ex-Nuffield Mech. Factory, Gosford Street, Coventry.	E. Whittindale, Son & Lilley, 19, Warwick Row, Coventry. Tel. : Coventry 2913.
March 4th to March 5th.	R.A.F. M.U. 259, Sub site, Woolfox Lodge, Greetham, Rutland.	Messrs. Royce, Market Street, Oakham. Tel.: Oakham 20.
March 4th to March 5th.	Depot 100, R.M. Engineers Stores Base, Challow, Berks.	Hobbs & Chambers, Faringdon, Berks. Tel.: Faringdon 2113.
March 8th to March 12th.	Depot 65, Wivenhoe Shipyard, Wivenhoe, Essex.	F. S. Daniell & Son, Headgate, Colchester. Tel.: Colchester 3336.
March 8th to March 12th.	R.A.F. M.U. 265, Grove, Wantage, Berks.	Adkin, Belcher & Bowen, Market Place, Wantage, Berks. Tel. : Wantage 48.
March 9th to March 12th.	Depot 154, Castlecourt, Westgate Street Cardiff.	Stephenson & Alexander, 5, High Street, Cardiff. Tel. : Cardiff 3249/50.
March 10th.	R.A.F. M.U. 14, Carlisle.	Harrison & Hetherington, 147, Botchergate, Carlisle. Tel. : Carlisle 1792/3.
March 16th to March 17th.	M.O.S. Depot 155, Desford, Nr. Leicester.	Warner, Shippard & Wade, 16-18, Halford Street, Leicester. Tel. : Leicester 21613.
March 16th to March 19th.	M.O.S. Depot 46, Cornholme Mills, Todmorden, Yorks.	Salisbury & Hamer, 50, Ainsworth Street, Blackburn. Tel. : Blackburn 5051.
March 17th to March 19th.	M.O.S. Depot 47, Test Houses, Bristol Tramways, Bristol.	Edward T. Parker & Co., St. Stephen Street, Bristol. Tel. : Bristol 22581/2.
March 17th to March 19th.	M.O.S. Depot 89, Aber Tinplate Works, Llansamlet, Swansea.	J. Oliver Watkins, 28, Walter Road, Swansea. Tel. : Swansea 4121.
March 17th to March 19th.	M.O.S. Depot, Newbury Racecourse, Newbury, Berks.	Deweatt, Watson & Barton, Market Place, Newbury. Tel. : Newbury 1.
March 18th to March 19th.	M.O.S. Depot 107, Upper Hatton, Swynnerton.	Heywood & Son, Coronation Chambers, Ironmarket, Newcastle, Staffs. Tel. : Newcastle-under-Lyme 67343/4.
	Small Tools & Equipment, Testing Machines and Measuring.	
March 23rd to March 24th.	Sale at Winchester House, Old Broad Street, London, E.C.2.	Leopold Farmer & Sons, 46, Gresham Street, E.C.2. Tel. : Mon. 3422.
	Vehicles, etc.	
March 1st to March 4th.	R.A.F. M.U. 246 Bicester, Oxon.	E. P. Messenger & Son, 4, King Edward Street, Oxford. Tel. : Oxford 47281.
March 8th to March 19th.	M.O.S. Depot, Winterslow, Nr. Salisbury.	Woolley & Wallis, Castle Street, Salisbury. Tel.: Salisbury 2491.
March 8th to March 19th.	M.O.S. Depot, Knole Park, Sevenoaks, Kent.	Cronk Pattullo, 138, High Street, Sevenoaks, Kent. Tel. : Sevenoaks 4674.
March 15th to April 8th.	M.O.S. Depot, Byram Park, Brotherton, Yorks.	Hollis & Webb, 3, Park Place, Leeds, 1. Tel. : Leeds 29671/2.
	Radio and Photographic Equipment.	
March 15th to March 18th.	R.A.F. M.U. 260, Sub site, Montrose, Scotland.	The Montrose Auction Co., Hume Street, Montrose. Tel. : Montrose 58.
March 16th to March 18th.	R.A.F. M.U. 3, Sub-site, Kingston, Bagpuize, Berks.	Adkin, Belcher & Bowen, 10, High Street, Abingdon. Tel. : Abingdon 25.
March 31st to April 9th.	M.O.S. Depot 121, Ashchurch, Glos.	Bruton, Knowles & Co., Albion Chambers, Glos. Tel. : Glos. 2267 ; and Geo. Hone, 120, High Street, Tewkesbury. Tel. : Tewkesbury 10.
	Miscellaneous R.A.F. Stores and Equipment.	
March 2nd & March 3rd.	M.O.S. Store 136, Watford-by-Pass, Aldenham, Herts.	Goddard & Smith, 22 King Street, St. James, S.W.1. Tel. : Whitehall 2721.
March 3rd & March 4th.	R.A.F. M.U. 61, Sub-site, Cranage, Cheshire.	Brady & Son, 17, Warren Street, Stockport. Tel. : Stockport 2252/3.
March 5th.	R.A.F. M.U. 7, Sub-site, Staverton, Glos.	J. Pearce Pope & Sons, St. Aldgate Chambers, Glos. Tel. : Glos. 2274.
March 9th to March. 18th.	Depot 122, Burtonwood, Nr. Warrington, Lancs.	Herbert Johnson & Son, 73, Sankey Street, Warrington. Tel. : Warrington 1689.
March 10th.	R.A.F. M.U. 16, Sandon Road, Stafford.	South & Stubbs, Bank Passage, Stafford. Tel.: Stafford 82.
March 23rd to March 24th.	R.A.F. M.U. 25, Hartlebury, Kidderminster.	Nock & Joseland, Bank Buildings, Kidderminster Tel. : Kidderminster 2053.
March 31st to April 1st.	R.A.F. M.U. 35, Sub-site, Bowlee, Manchester.	C. W. Provis & Sons, 2, Booth Street, Manchester 2. Tel. : Manchester Cen. 2800.

Although it is anticipated that these sales will take place on the dates shewn, they should be taken as *tentative*, but the change of dates, if any, will only be a few days.

Lists of the type of stores to be included in the sales are not yet available, in the majority of cases they will be of a miscellaneous character : Electrical, Mechanical Plant and Equipment and Textiles, at each sale.

The Burden of the Middleman

by J. C. MATHEW

DANGEROUS competition threatening Britain's export drive may be beaten by an enterprising young company. Our future is in the balance—that is recognised and accepted. By far the greater part of our industrial output is concentrated on foreign demand, and our industrial prosperity is dependent upon our ability to deliver our products to overseas markets at prices favourably comparable to those of other exporting countries.

What are our chances ?—Alarmingly poor, under the existing system. For reports recently studied indicate that the seller's market is over. The immediate post-war enthusiasm for products—the short-lived dream-era where " anything will sell itself "—is being rapidly stemmed by an increasing shortage of money and at the same time, American imports are in many cases being cut as reprisal against tariffs and duties imposed by us on American exports.

On the other hand, previously backward countries have, during and as a result of the war, become progressively industrialised and, with imports of the most modern British and American machinery, are beginning to break into world markets with products in direct competition to our own. These rising countries can, if by their considerably lower wage-rates alone, put up strong competition. Again, America, with her abundant supplies of raw material and the keen incentives provided by unfettered enterprise ; with her advanced mass-production and " power-through-dollars " is in a stronger position than many of us care to admit.

We are faced therefore, in the markets of the world, with an imminent danger of highly competitive price levels, and the bare truth is that if British products are going to compete successfully British prices must be cut.

Where is the cut to be made ? Quality cannot suffer : competition in quality is as rife as competition in prices, so that prices cannot improve at the expense of quality. Raw materials are in full demand, and no reduction is likely there. Wages are controlled ; overheads are in most cases already kept down to a minimum, and manufacturers are naturally reluctant to further impose on profits. The answer lies beyond the factories—in our present syetem of distribution.

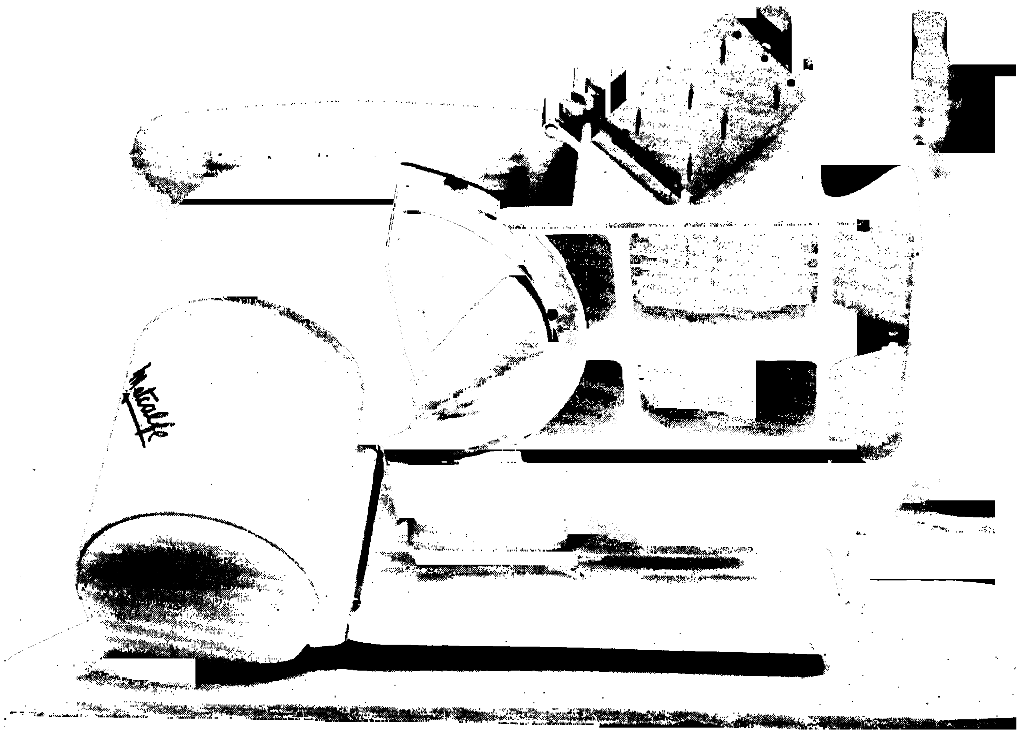
It has long been our contention that selling prices abroad must sooner or later cease to bear the burden of the non-productive agents, brokers, shipping and export merchants whose accumulated profits have often been known to add as much as 25% to originally intended selling prices. It has been increasingly obvious to us that they must go, and it is with enthusiasm rather than surprise that we were introduced to a rising young company designed to do just that—to eliminate the middlemen.

Their purpose, we gathered from interviews with the directors concerned, is to exhibit, publicise and sell high quality British products in overseas markets. Their object is to promote in world markets a high reputation for themselves, for the manufacturers they represent and, consequently, for British trade in general by giving overseas buyers a service respected for prompt delivery of the right goods at the right price.

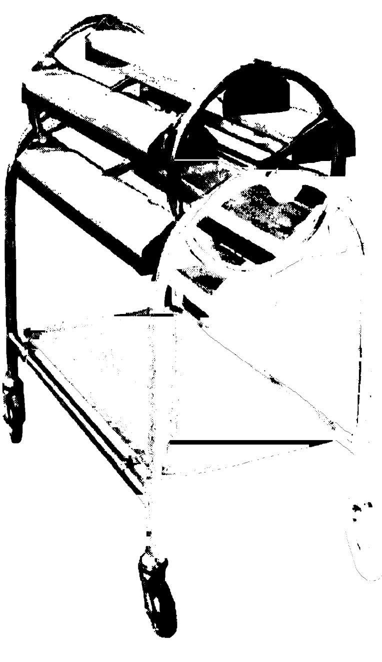
The company, in effect, operates as a direct agent between British Producer and overseas seller, allowing a minimum margin of profit to cover company expenses. To accomplish this an organisation of agents and representatives has been built up to form a net-work covering the main markets of the world. In Europe, operations are directed from Brussels; and in America, from New York.

In these cities, showrooms (perhaps the most interesting feature of the organisation) have been established, providing a permanent exhibition of British products. The value of such showrooms is evident when we consider that Brussels is the recognised centre of Continental trade ; that it is to Brussels that the buyers of Europe flow, and through Brussels that consignments pass. The advantages of a British showroom in New York are similarly apparent. These showrooms, we were told, are already proving a valuable service both to producers and to the scores of buyers visiting them weekly, while the recently opened showrooms in New York are creating keen interest in America.

We gathered that the company further undertakes to submit periodical reports on buyers' and public opinion ; fluctuations in prices, supply and demand ; changes in fashions and variations in needs. The tendency of this is to heighten British prestige and lower British prices in export goals—and, above all, to relieve industry in general from the burden of the middleman.



INDUSTRIAL DESIGN AND PRODUCT STYLING AESTHETICS



The somewhat unusual appearance of this slicing machine is a result of using chromed or plastic mouldings and pressings with flow lines based on gravity feeding of the blade by a loaf of meat and on motion economy applied to loading and unloading the machines. Perspex end mouldings in white, encourage the hygienic sales appeal essential to all food serving equipment.

The rotating mechanism of the hors d'oeuvre conveyor, with its clean plastic trays, emphasises the invitation to the consumer or buyer, to spin the wheel until he had surveyed everything and made his choice. It removes the observation reflex sometimes present when others serve us with a range of wares and which may fluster a nervous or self-conscious person.

Continued from page 47

Fig. 4 shows a portion of the test grinding department of the Pulverizing Machinery Company of Summit, New Jersey, with the acoustical tile applied to the ceiling and part way down the side walls. The tile on the latter consists of about 1000 square feet of Acousti-Celotex, type C-8, 24 inches by 24 inches by 1 inch thick, and having a noise reduction coefficient of 70%. Smaller tile, 12 by 12 inches by ¾ inch thick, known as type C-9, was used for the ceiling. All tile in this room was nailed to wooden furring strips. In the sheet metal and welding shop it was cemented to the ceiling and part way down the side walls.

The application of tile to the side walls becomes desirable where the room is comparatively small, the volume of noise high and of high frequency, because the reflection from the walls otherwise tends to build up to a very annoying extent. The management reports a very marked improvement in noise conditions in this plant, which is consistent with experience in other more or less similar locations.

In another machine shop, shown in Fig, 3, erected during the war, acoustical ceilings were provided to reduce noise levels as a general efficiency measure. This was especially desirable as the work done here consisted mostly of the manufacture of precision parts for aircraft engines, calling for close tolerances and close mental concentration, which excessive noise makes difficult and fatiguing.

Sound conditioning is also often very important from the standpoint of safety. Where noise causes fatigue with resultant slowing of mental and physical reactions to danger there are likely to be more accidents. In addition, high noise levels may drown out warning sounds such as occur when machines or belts get out of order and are about to break down, possibly entailing injury or interruptions of production. When an operator can hear his own machine he can usually tell if it is working properly, but this is impossible if the surroundings are too noisy.

Investigations in a plant where several accidents occurred in the punch press department due to workers being hit by electrical industrial trucks operating in the aisles showed that the warning signals on the trucks could not be heard. This noisy condition, furthermore, seriously slowed the movement of material because the trucks had to proceed with extreme caution, and take time for people to get out of their way. Acoustical treatment in this department eliminated the accidents and it ceased to be a bottleneck in the internal transport system.

Of course in the two instances just cited sound conditioning had the usual beneficial effects in regard to the hearing and nervous fatigue of the operators, increased production, less spoilage, etc. But it is interesting, and worth careful consideration, that sound conditioning can be so helpful in reducing accidents and correcting such difficulties, at first seemingly unrelated, as transport congestion. Management is likely to find it decidedly profitable to give free rein to its imagination when considering noise and the possible advantages of its abatement. A few simple tests and analyses may well show surprising possibilities.

Continued from page 54

been made to demonstrate some of the principles, and basic equipment involved, and their application in practice. But even in the whole series of articles it has been impossible to do more than glance at the subject ; but perhaps some of the more mysterious aspects have been made clearer, snd some of the practical possibilities revealed.

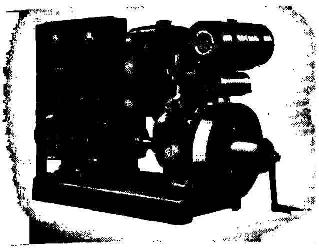
The question may arise : Can electronics find application in every industry ?

All that can be said now is that generally there is likely to be an electronic technique that ought to be considered when existing methods seem to be lacking in some respect.

It is no exaggeration to say that electronic engineering will in the course of time revolutionize many industrial processes, especially by providing for automatic operation of machines and equipment. And in that way we may eventually be able to restore a high level of prosperity by producing an expanding volume of goods both for export and for home consumption.

Review of EQUIPMENT

Generating Plant



Originally designed for farmers and provided with a convenient power take-off, this compact unit comprises a Turner diesel engine, direct coupled to an alternator, complete with simple switchboard, which provides electricity for lighting, driving machinery, etc. The pulley fitted to the engine is 7 in. dia. x 7 in. face, this face width being adequate to accommodate fast and loose belt drives.

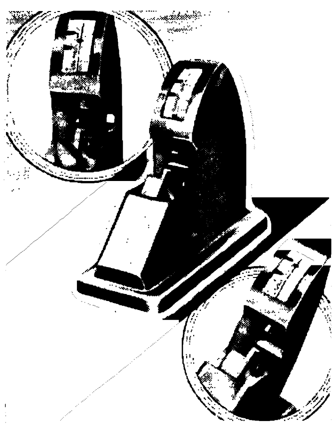
Supplier —**Turner Manufacturing Co. Ltd.,** Wulfruna Works, Villiers Street, Wolverhampton.

Centreless Grinder

The Churchill Centreless Grinding Machine covers a much wider range of work than is generally associated with this type of machine tool, and the new applications maintain the high rate of productivity that has always been one of the main characteristics of centreless grinding. Quantity production of an enormous variety of components has been achieved by the provision of suitable workrests, fixtures and wheel truing and forming equipment

Supplier :—**The Churchill Machine Tool Co. Ltd.,** Broadheath, near Manchester.

Screw-Thread Comparator



This "O-Vee" measuring instrument brings the accuracy of the wire method of screw thread measurement right down to absolute simplicity, recording variations of effective or pitch diameter on the indicator scale equipped with tolerance pointers for use by skilled or unskilled labour.

The measuring elements are pairs of helical springs of the correct size wire to suit the thread being measured. Each set of springs is in a container marked with the pitch of the screw for which they are intended.

Two constant dimensions are also engraved on the container, one for Whitworth and one for U.S. threads.

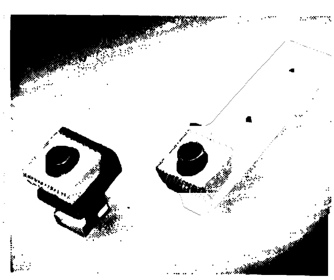
Supplier :—**J. E. Baty & Co. Ltd.,** 39 Victoria Street, Westminster, London, S.W.1.

Plastic Welder

Above is shown the Model J.P.1 Redifon welder, a special leaflet describing this machine is available from the suppliers. The sliding-tray electrode is an exclusive feature which enables the J.P. 1. to be jigged quickly for a range of welding operations. Locating frames and top electrodes can be changed in a matter of minutes.

Supplier:—**Rediffusion Ltd.,** Broomhill Road, London, S.W.18.

Clamping Devices

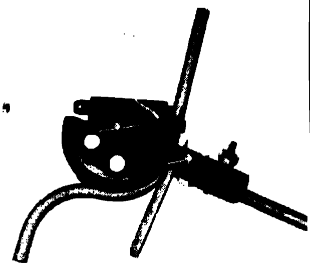


These clamps are adjusted as closely as possible to the workpiece and securely clamped to the table. The jaws are then opened or closed by a half turn of the jaw screw.

Supplier :—**Adam Machine Tool Company Limited,** Acme Works, Waverley Road, St. Albans, Herts.

Review of EQUIPMENT

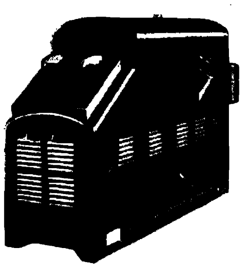
Pipe Bender



We show, above, an ingenious pipe bending machine—the "Tubela" Model T.3. The machine is fully adjustable and can form quite intricate bends and shapes.

Supplier :—**Lawler, Ayers & Co. Ltd.**, Broad Street House, 54, Old Broad Street, London, E.C.2.

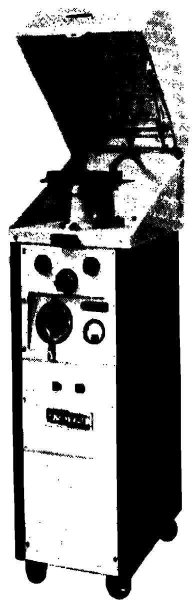
Power Plant



This is a particularly neat enclosed power plant. Both the engine and the alternator are mounted on a combined fabricated steel baseplate; the simple pattern switch-board includes an ammeter, a voltameter; and a main switch with fuses for the protection of the plant. The switchboard is fixed on the set, and is rubber mounted to protect the meters from harmful vibration.

Supplier :—**Turner Manufacturing Co. Ltd.**, Wulfruna Works, Villiers Street, Wolverhampton.

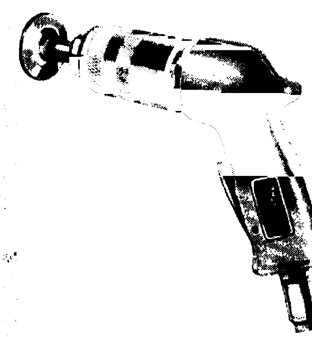
Radio Heater



The H7/A is a compact radio heater delivering up to 45 Th.U.(11 Kg. Calorics) per minute at approximately 22 megacycles per second. It has been designed primarily to provide the Plastic Moulding Industry with an equipment suitable for plasticising up to 3 lbs. (1.36 kgs.) of powder or preforms with normal moisture content, at a rate of up to 10 oz. (258 grams) per minute. As with all other models in the Radyne range, the styling and finish are in high-grade glossy cream and black stove enamel.

Supplier :—**Radio Heaters,** Toutley Works, Workingham, Berks.

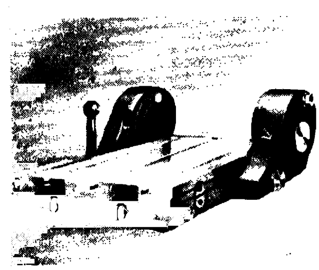
New Air Hammer



The illustration shows a new one-handed air hammer weighing 20 ounces and working at up to 80 lbs. pressure.

Supplier :—**Hymatic Engineering Co. Ltd.,** Redditch, Worcestershire.

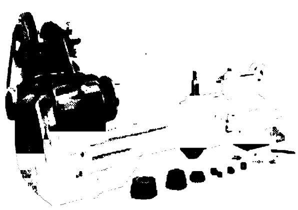
Inclinable Table



Designed for use with the Optical Circular Table for mounting work at any angle to the boring head of a jig borer. Angles from 0 to 90 degs. can be set by means of the built-in protractor scale and securely locked.

Supplier :—**Coventry Gauge & Tool Co. Ltd.,** Fletchamstead Highway, Coventry.

Halifax Lathe



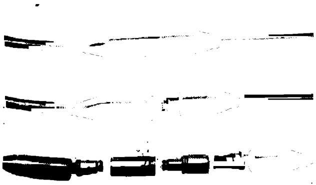
The introduction of this British machine fulfils a long-felt need. Having a wide bed with robust, square section ways, it is capable of withstanding comparatively heavy usage whilst being extremely compact and economical both in initial layout and subsequent running costs.

The lathe base carries fixing holes for bolting down to bench or stand.

The machine has a 10 in. swing over the bed and the spindle is mounted in Timken Taper Roller Bearings, the bed being precision ground; and 16 speeds are available, 8 changes through the pulleys and a further 8 through the back gears.

Supplier :—**E. H. Jones Machine Tools Ltd.,** Edgware Road, The Hyde, London, N.W.9.

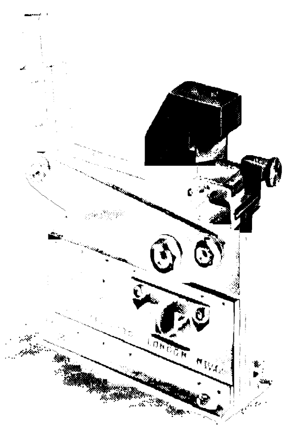
Cable Connector



The " RCM " quickly detachable connector shown here will take welding cables from size 4 to size 00 and may be used for joining large to small cables should this be necessary. In addition to being extremely light in weight, it is completely insulated and will carry all normal welding currents without any over-heating.

Supplier :—**The Lincoln Electric Company Ltd.,** Welding Development Department, Welwyn Garden City, Herts.

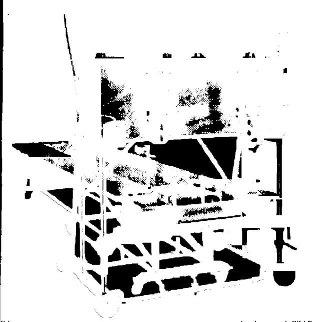
Angle Cropping Machinery



This machine is suitable for making right angle and mitre cuts in angle section and 90 degree vee notches in the web of the section prior to bending for the production of angle section frames. A hold-down is provided which keeps the section steady while it is being cut either at right angles or with left or right-hand mitres at 45 degrees.

Supplier :—**F. J. Edwards Ltd.,** 359-361 Euston Road, London, N.W.1.

Can Filling Machine



The Triumph "F" tin and drum filling machine, shown here, will fill two containers at once, and convey them to the packing tables each side of the conveyor. By its use unskilled or semi-skilled labour may be employed.

Supplier :—**Roberts' Patent Filling Machine Co. Ltd.,** Bolton.

Handy Anvil

A useful light anvil for the toolroom or handyman's workshop.

Supplier :—**K. and L. Steelfounders Ltd.,** Letchworth.

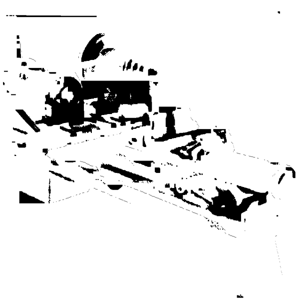
Review of EQUIPMENT

4 Cyl. Diesel Engine

This 4V95 Diesel engine has a power output of 30 h.p. at 1,500 r.p.m. The cylinder head contains a special combustion chamber which ensures quick starting from cold, high operational efficiency on almost any type of fuel and the utmost economy in fuel. The cylinder layout remains similar to the 2V95 engine, namely, two banks of two cylinders inclined at 68°.

Supplier :—**Turner Manufacturing Co. Ltd.,** Wulfruna Works, Villiers Street, Wolverhampton.

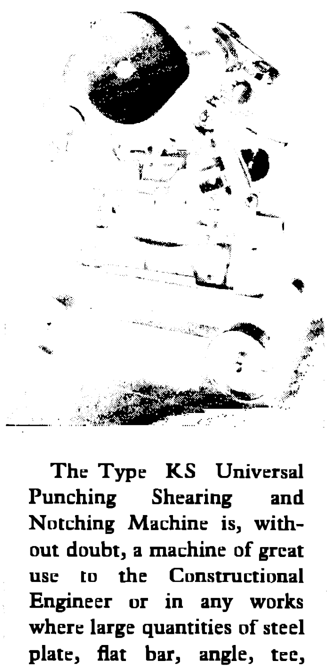
Precision Capstan Lathe



In this " Boxford " ½ in. collet capacity capstan lathe the headstock is half enclosed to guard the belt. Eight speeds from 180 to 2100 r.p.m. are obtainable with a 1/3 H.P. motor running at 1,425 r.p.m. via an independent countershaft and four step cone pulley. The range of these speeds may be increased from 360 to 4200 r.p.m. with a 2,850 r.p.m. motor.

Supplier :—**Denfords Engineering Co. Ltd.,** Box Trees Mill, Wheatley, Halifax.

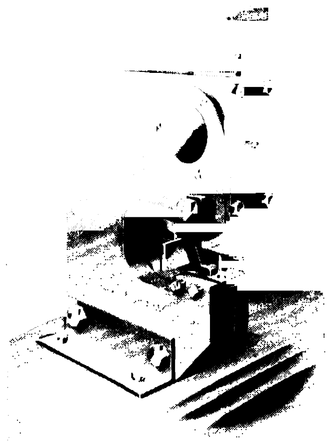
Punching, Shearing and Notching Machinery



The Type KS Universal Punching Shearing and Notching Machine is, without doubt, a machine of great use to the Constructional Engineer or in any works where large quantities of steel plate, flat bar, angle, tee, round and square section are required to be cut, punched or notched. The machine is suitable for mounting on a concrete foundation block or as generally supplied, for portable use, mounted on a four-wheel truck.

Supplier :—**F. J. Edwards Limited,** 359-61 Euston Rd., London N.W.1.

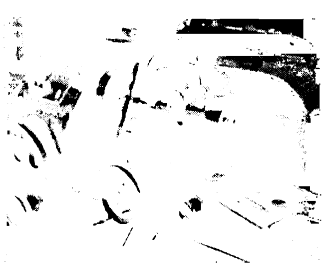
Punching Machine



The Type OS Punching Machine is designed for punching holes in plate, flat bars and the flanges of angle and tee sections. The webs of small channel sections can also be punched.

Supplier :—**F. J. Edwards Limited,** 359-61 Euston Rd., London, N.W.1.

Special Purpose Machinery



Above is a photograph of a special purpose lathe device for jig and tool work. The makers offer an unusual service in the design of this type of device. Details from :—

B.I.P. Tools Ltd., 147, Tyburn Road, Erdington, Birmingham.

INSTRUMENT MOUNTINGS TO COMBAT VIBRATION

ANTI-VIBRATION instrument mountings made by Dunlop, and as yet unknown to industrial instrument manufacturers, were mentioned by Mr. E. Simpson, A.I.R.I., in a paper on the installation and maintenance of industrial instruments which he read to the Midland section of the Society of Instrument Technology.

He demonstrated how vibration was counteracted on recording potentionmeters in a rubber mill where vibration of walls and floor was probably as bad as anywhere at times. One difficulty not entirely surmountable in anti-vibration occurred where pipes or conduits had to be taken to instruments for carrying wiring, compressed air, or other services as these pipes would transmit vibration to the instrument in spite of other precautions.

An instrument containing a built-in motor or other mechanical source of vibration, could possibly be carried on anti-vibration mountings within the instrument case itself. Instruments, particularly heavy ones, could be mounted on panels suspended on springs under tension with complete success if the springs were correctly chosen in relation to the weight they were to carry, and the nature of the vibrations. This method was successfully employed where panels, each carrying six electrical indicators, had to be installed close up to, or carried from the framework of, large calenders absorbing 500 horsepower through very heavy gearing.

Where the use of instruments in an organisation was extensive, said Mr. Simpson, the existence of an established instrument department was obviously justified. In the direction of preventive maintenance, considerable help could be obtained by co-operation from production foremen if they were encouraged and trained to be instrument-minded.

PLASTICS

by W. S. PENN, B.Sc.

POSSIBLY the ultimate aim of all mass production techniques is to apply automatic methods. The plastics industry is no exception to this rule and, for many years, it has been striving to develop satisfactory automatic moulding processes for thermosetting plastics. This was actually effected many years ago but equipment was unwieldy and it cannot be said that any of the methods became popular, particularly in the U.K. In America, some mass production techniques have been used but even there they were not very popular.

A very pleasant surprise has been given in the production of a new moulding press which is completely self-contained and automatic for the production of thermosetting mouldings. The machine was developed by the Tavannes Machines Company of Switzerland and is being marketed in this country by Alfred Herbert Limited of Coventry. The principle of the machine is not new but its compactness and the fact that it is being produced at all, is a novelty. Most automatic machines have only been experimental and have rarely been offered to the industry.

Normal Methods.

Before proceeding to describe the principles of this machine, it would be best to recall briefly the normal method of compression moulding. This involves fixing the two halves of a die to separate platens of a hydraulic press. The moulding powder, in pellet form, is then placed in one half of the die and the press closed, thus mating the two halves. The application of heat and pressure effects the curing process, when the press is opened and the moulding ejected.

The operator usually has to place the pellets in the various cavities in the mould, has to close the press and remove the finished mouldings. In the case of the automatic moulding press the operator only has to keep the hopper charged with pellets. The finished moulding is delivered at the other end of the press. It would be possible for one operator to look after at least a dozen of these presses without any trouble at all, whereas in the normal method the most he can manage is two presses. The advantages of this new machine are therefore obvious.

Basic Principles.

In effect the automatic press consists of ten little compression moulding presses in one machine. In other words, there are ten hydraulic cylinders spaced equidistantly round the vertical axis of a drum. Each one operates completely independently of the others. Each of the cylinders is fitted with a die and there is a counter plunger to mate this die in the upper part of the drum. By means of a suitable driving mechanism the cylinders are made to rotate intermittently and with an anti-clockwise movement. Thus at each individual movement each cylinder is brought into the space previously occupied by the preceding cylinder.

To explain the action it is best to divide the circumference of the drum into ten positions. At position one the pellet is loaded into the die and this particular die then passes to position two where the plunger is mated into the die. Between positions three and nine the curing takes place and between positions nine and ten the die opens. At position ten the moulding is ejected. In case surplus moulding powder in the form of flash is present in the die, a jet of compressed air is arranged to clean the die. This cylinder then returns to position one and the cycle is repeated.

Other Considerations.

At the one side of the machine is provided a hopper into which the pellets are loaded. This hopper holds about 2 lbs. of plastic. It is only necessary to pour the pellets into the hopper and then these are automatically singled out and collected by a rotating disc into eighteen cavities, each of which contains a pellet. Like the drum, this disc revolves with an intermittent movement which forces the pellets into a channel. The end of this is immediately over position one mentioned above and the pellets are released singly by means of a vibrating finger. This position may be termed the loading station.

The dies are heated continuously and the heating elements are situated under a protective hood which covers the whole of the top of the cylinders. It is possible to raise this by means of a pulley arrangement fitted with a counter weight to facilitate the raising operation.

It may be mentioned that this particular type of press was primarily designed to mould closure caps and various types of covers for bottles, tubes and jars. This means that one of its special design features is an arrangement for unscrewing threaded articles. In fact, the machine was specially designed for this and it is rather difficult to mould anything without taking advantage of this. If, therefore, relatively flat sides are required, a very light thread should be incorporated and so the unscrewing device can be employed. It is possible, however, to have a special extractor mechanism and this has been employed in the case of buttons. The ejection, mentioned at position ten when describing the moulding cycle, is actually the unscrewing operation which is, of course, carried out automatically.

Output.

The output of these automatic machines obviously depends on the size of article to be produced and the type of moulding powder employed and one or two other factors. To take a typical example, one may consider the production of caps about 1 3/16 in. in diameter and 1 in. high. It is possible to produce between 600 and 900 caps per hour, the variability arising for reasons already mentioned. This, however, applies to press Type 5A, where each of the ten dies contains one cavity only. Another type has been designed, 5B, where the single cavities are replaced by triple cavities. This allows the output to be increased to between 1900 and 2700 per hour.

It should be mentioned that the figures quoted above were obtained by the use of a phenolic moulding powder. It is possible, however, to employ any type of thermosetting moulding powder desired. These will only involve different curing times and the machine is so arranged that the time of cure, which is the time it takes for any particular cylinder to pass between positions three and nine, can be varied at will.

General Requirements.

It is possible to employ this machine in those plants not normally devoted to the production of plastic mouldings. This is because it is so compact. However, various ancillary equipment is useful if the production of these moulded articles is to be completely self contained. First of all most plastics manufacturers nowadays have pelleting machines of their own, although it is possible to purchase moulding powders in pellet form direct from the manufacturers. Again, it is necessary to make the dies themselves, although, naturally, this again can be done by some outside firm. It should be mentioned that since ten dies all exactly the same are to be produced, some suitable duplicating equipment is necessary if the process is to be economical. There are duplicating milling machines and hobbing techniques which are suitable for this operation. Finally, the mouldings are likely to have a certain amount of surplus powder in the form of flash attached to them. This has to be removed and although it could be done by hand, it is best to employ tumbling barrels, particularly with small objects produced on a large scale.

It may be concluded that this press is a step forward in the development of compression moulding presses. The producers are to be congratulated on this machine and it is hoped that it will stimulate the development of further machinery along the same lines. Since the plastics industry is becoming so highly competitive, this will be necessary to achieve the most efficient results.

By Our Market Correspondent.

The Commodity Markets

Controlled Products and Industrial Materials

THE adjustment in many controlled prices to offset higher labour and material costs, coupled with the consequences of the rise in coal and increases in rail freight rates, have effected an upward trend in the official price index. The quotation of primary products in world markets has exerted its influence on wholesale prices but relative stability has been maintained for industrial materials and manufactures, classified into basic materials, intermediate products and manufactured articles. Metals, being controlled, have shown their influence where altered by official adjustment.

There is little doubt that all four of the principal base metals—copper, tin, lead and zinc—are now in sufficiently tight supply to make them sensitive to increased demand following any successful European recovery programme.

At one time last year it was almost taken for granted that prices had reached their peak. In the non-ferrous group Zinc was regarded as likely to lead the downward movement but the U.S. stockpile purchasing modified the statistical position sufficiently to remove the potential weakness in the price structure.

Copper's Secular Trend.

The Market in COPPER is firmer than it has been for some months. The position at the moment is governed mainly by the amount of U.S. stockpile buying, the dollars which European countries have available for supplies and the extent of the Chilian production. Every effort is being made to increase Rhodesian output of the metal for our benefit, so as to save Chilean dollar copper.

The effective world price is now 22 cents a pound f.a.s. for Electrolytic Copper. This is equivalent to over £122 a ton. Deducting say £5 a ton from the British official selling price of £132 to cover freight and delivery charges, this leaves the latter about £5 a ton over the world price.

Recent figures given out by the British Non-Ferrous Metals Federation, stated that U.K. output of main copper and copper alloy products last year totalled 680,434 long tons, compared with 636,396 in 1946, the copper content being 540,886 long tons, against 493,716. Consumption of virgin copper was 350,119 long tons against 325,409 of copper and alloy scrap 190,767 against 168,307 tons.

Tin and Steel Products.

TIN remains at its newly pegged price—99% to under 99¾%, £519 per ton. A stabilised figure is being talked of. This implies the existence of a residual buyer and a bull seller, and if it comes about, it may mean the imposition of upper and lower price limits such as were imposed in the immediate pre-war years by the operations of the Buffer stock.

There still seems to be an acute shortage of ready supplies of the metal and the 17,703 tons interim allocation for the first half of the current year seems disappointingly small but there is a shortage of Straits metal. Malayan producers are believed to be holding back supplies of concentrates in the hope of a further price increase.

Although the nationalisation of the coal mines has not shown many charms to sooth the savage breast, increased production of coal has removed a good deal of uncertainty in industry. It has, however, necessitated a higher maximum for iron and steel products. Ingot steel (of which it is aimed to produce 14,000,000 tons this year) has been raised by 5s. a ton. For re-rolled bars, sections and hot rolled strip there has been a basic increase of 6s. a ton. Electrical steel sheets have been raised by 7s. 6d. a ton while basic pig-iron and hematite pig-iron have gone up by 9s. a ton. Foundry and forge pig-iron has been raised 4s. a ton.

Zinc : Statutory Selling Price.

The demand for LEAD and ZINC continues to run well ahead of available supplies and, so far as can be judged at present, an easing of the situation is not in sight.

The trend of ZINC is upwards and now in the region of 26,500 tons a month, though figures given in the Zinc Development Association's statistical Review indicate fluctuating demand.

As a result of the rise in American and Canadian Domestic zinc price, which took place in January, the Home Ministry of Supply announced an increase in the statutory selling price of £5 to £75 a ton, the first increase for just over a year, while zinc oxide was raised by £4 5s. 0d. a ton.

The exact details of the Ministry's contracts with the Empire zinc and zinc concentrate producers are unknown except to a select few. It is, however, believed that the price is fixed on the basis of the formal U.S. quotation.

New LEAD is still short and secondary metal sells at very full prices. The Australian Government has authorised the export of 50 per cent. of its holdings of scrap LEAD to Britain to enable us to conserve dollar purchases. There is some expectation that a rise in the U.S. price of the metal may soon come about.

On account of printing exigencies, Commodity prices and indices mentioned above were struck on a certain day during the month; alteration in price movements since then must be allowed for.

AMERICAN DIGEST

Bringing news of the latest developments from the U.S.A.

Loom for Wire Mesh. The Thomson Electric Welder Co. has developed a machine producing wire mesh rapidly. The machine is really a spot welder with a bank of 25 electrodes and can deliver netting up to 48 in. wide from wires ranging between 0 and 14 gauge. To produce diamond or diagonal patterns the electrode assembly is moved to right or left. Longitudinal wires are fed continuously whilst traverse wires are inserted in position by a moving carriage which causes power to be applied to any predetermined pairs of electrodes as it runs across the machine.

Spiral Saw Difficult curves, intricate scroll work and square corners may be cut with ease with the new spiral saw blade developed by the Tyler Mfg. Co. in the U.S.A.

Teeth are cut spirally the full length of the blade, making it possible to cut wood, plastics or thin metal in any direction without the operator having to turn either the saw-frame or the work.

The blades will fit most machine saws and will not bind, break or become difficult to start after much use. They are made of oil-tempered spring steel and can be tied into knots without breaking.

Red Mercury Thermometers. Industrial and laboratory thermometers which appear to have red mercury in them are a speciality of the Palmer Co. of America. These thermometers actually have normal mercury in them but it is caused to appear bright red to the eye by means of an ingenious patented optical arrangement incorporating a strip of red glass fused into the tube. This strip is invisible to the eye but is reflected in the mercury column and gives immensely easier reading.

Ultrasonic Thickness Tester. The "Audigage" is an interesting development in a group of instruments which use ultrasonic frequencies for the non-destructive testing of materials.

It is a portable instrument weighing only 14 lbs. and operating from dry batteries.

A narrow ultrasonic beam is directed on the test material and the reflection is picked up and the distance travelled by the waves is measured by reference to an audio modulation level. In practice, a dial is turned until the sound in telephones is at a maximum and the thickness read by direct reference to the dial.

The instrument's range is 0.09 inch to 4.0 inches with an accuracy of $\pm 2\%$. It can be used for measuring any metal or glass.

Midget Heat Treater. For experimental development work or small-scale production jobs, the Gas Appliance Service Co. of Chicago has marketed a small gas-burning unit 43 in. high and 30 in. in diameter for brazing, hardening, annealing, etc.

Twelve burner arms are fitted and they can be used with a variety of nozzles. The work can be rotated by an electric motor during treatment.

Typical production rates are, hardening: 60 small pieces per hour; brazing or soft soldering: 100-200 pieces per hour.

The price of the equipment (F.O.B. Chicago) is £150.

Visual Gauge Inspection. An American chemical company has developed an extremely useful finishing process for precision gauges. After final approval they are given a single-bath treatment which gives them a rich black surface not more than 0.0001 in. thick, without any change in the gauge dimensions or surface hardness. This guarantees that the gauges are not over-used, tampered with or stained in humid weather by moisture on workers hands.

100 Ton Press for Plastic Moulding. The Watson-Stillman Co. has announced a 100-ton press suitable for compression or transfer moulding of plastics. It is semi-automatic in operation and degassing is controlled on a time basis rather than by limit switches as the former method permits more flexible adjustment.

Open four-column construction is provided so as to allow the rapid dissipation of heat which would otherwise be taken up by the frame of the press. This open construction also permits easy access to the moulds.

The power unit includes a pump, valve and controls.

The pump is a radial piston type with built-in short-stroke control and the power unit can be varied in an infinite number of steps to within 25% of the total tonnage of the press.

An Announcement of Considerable Importance to the Smaller Manufacturer . . .

SPECIAL PURCHASE FACILITIES.

The use of fine Measuring and Inspection plant is essential to manufacturers, reducing rejections, increasing output and maintaining the maker's prestige amongst his customers. This was the case before the war, but today with keen competition ahead, greater advances in design and decreasing tolerances, it is more necessary than ever before to pay great attention to measuring and inspection during production and in the test house.

The addition of high grade measuring equipment need no longer be delayed by financial considerations. E. H. Jones (Machine Tools) Ltd., have instituted a confidential purchase facilities service which enables bona fide traders to equip their works with modern inspection and manufacturing plant at a minimum cash outlay.

It is the desire of E. H. Jones (Machine Tools) Ltd., to assist British industry in these difficult times and all enquiries will receive the personal attention of our Mr. W. Hadley, to whom letters should be addressed and marked "confidential."

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PERSONALITIES

Tube Investments Limited announce the following Board changes: **W. Lionel Fraser, Esq., C.M.G.,** has been elected a Director of the Company, and appointed a Deputy Chairman. **Sir Edmund Crane** has resigned from the Board, prior to his leaving the country for a visit to South Africa.

The United Steel Companies inform us that the following appointments have been made at the Appleby-Frodingham branch:— **Lt. Cdr. G. W. Wells** becomes Joint General Manager with **Mr. W. B. Baxter. Mr. A. Robinson** becomes technical consultant and a member of the Appleby-Frodingham Board. **Engr. Rear Admiral C. W. Lambert** becomes General Works Manager, and **Mr. A. Jackson, Mr. G. D. Elliott** and **Mr. W. Geary** are appointed Works Managers. **Mr. K. Paterson** takes over dutits as Chief Mechanical Engineer, and **Mr. J. L. Gaskell** is appointed Chief Electrical Engineer.

In 1912 Mr. John Fry founded the business of Fry's Metal Foundries. Now 36 years later, he has retired from the position of Chairman and Managing Director. **Mr. P. M. Parish** has been appointed Chairman and **Mr. G. W. Gibson** as Managing Director.

The appointment is announced this week of three new working directors to the Board of Hoover Limited. The new directors, all employees who have been with the company for around fifteen years are:— **Mr. S. T. Matthews,** manager of the Export and Contract department since 1934. Now devoting his time entirely to export. **Mr. W. C. Bell,** assistant production manager in 1933 and a year later chief engineer, a position he has held since. **Mr. P. Attwood,** purchasing manager for the company since 1934. In addition **Mr.T. E. Groutage,** general manager of the Scottish factory becames a director of the subsidiary company Hoover (Electric Motors) Limited.

Mr. H. L. Harden, Mr. B. L. Budd and **Mr. A. F. Thompson** have all joined the Chemical Engineering Department of Monsanto Chemicals Ltd.

Mr. H. D. Greenwood, hitherto Controller (Gas), C.C.G. (British Element) has been appointed Director of Public Utilities for the Control Commission. He is responsible for gas, electricity, water and sewage.

Dr. R. W. F. Tait has gone to South Africa to take up an appointment as lecturer in applied chemistry in the University of Cape Town.

It is announced that **Mr. G. W. Munton** has been appointed Director and General Manager of the Magnetic Valve Company, in succession to **Mr. E. T. Shopland.**

Mr. H. Cousins, Publicity Manager of British Aluminium Co., Ltd., has retired after 40 years service. As a result his department is now combined with the Sales Research and Statistical Section under **Mr. C. G. McAuliffe,** as Manager. The new Department will be known as Publicity and Sales Research Department and will commence operation on January 1st, 1948. **Mr. E. G. Fielding,** who will be responsible for the publicity work of the Department, will have the title of Publicity Officer.

Mr. W. R. Duncan

Mr. William R. Duncan, Works Superintendent of the David Brown heavy engineering division who was awarded the M.B.E. in the New Year Honours List, for services to industry, has been employed at the main works for 38 years and has the longest record of service of any member of the works staff. He is 63.

Air Ducts Limited announce that **Mr. C. J. Hyde-Trutch** has been appointed Director and Vice-Chairman of the Company, and that **Mr. F. Try** has retired from the Managing Directorship but will continue to serve on the Board. The appointment made vacant by Mr. Try's resignation is now filled by **Mr. W. W. MacArthur.** Other Directors appointed are **Messrs. G. Gibbson, L. R. Surtees** and **R. W. Freakley.**

Mr. J. Bodger has been appointed Joint Managing Director of Crittall Kitchen Equipment Company Limited, with **Mr. A. E. Hinds.**

It is announced that **Mr. H. O. S. Bridcutt** has resigned from the Directorship and General Managership of Channel Conduits Limited and is succeeded by **Mr. E. T. Shopland.**

Mr. R. D. Patterson has been appointed a Director of Grierson Limited.

Mr. S. G. Terjesen has left the Dyestuffs Division of I.C.I. Ltd., and is now with A/S. Norsk Spraengstoffindustri in Norway.

Richard Crittall Research and Development Limited announce that **Mr. W. R. Cox** has been appointed a Director and Vice-Chairman of the Company.

Dr. H. J. T. Ellingham has been elected President of the Commission of the International Union of Chemistry on Physico-Chemical Symbols and Co-ordination of Scientific Terminology.

There are no rule-of-thumb methods in aircraft manufacture. In design, every stress is calculated. In construction, accuracy is rigidly enforced. In test, nothing is taken for granted. From the airframe down to the smallest component, nothing second-best can pass into service. Most of Britain's leading aircraft manufacturers fit Exide Batteries as initial equipment in their latest aircraft. These batteries combining, in the highest degree yet known, light weight with great capacity and high performance with long life, were neither easily designed nor lightly chosen. It has taken the best brains of the biggest battery makers in Britain and the experience gained in fifty-six years of specialisation, to produce in Chloride, Exide and Exide-Ironclad better batteries than ever before.

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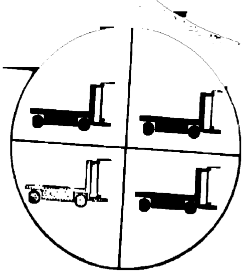

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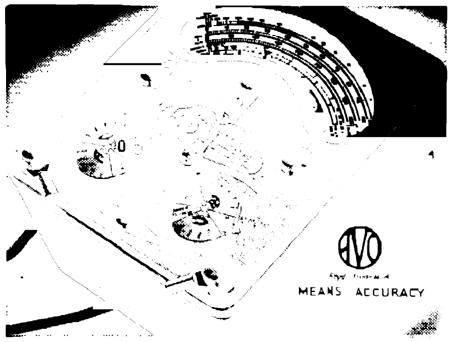

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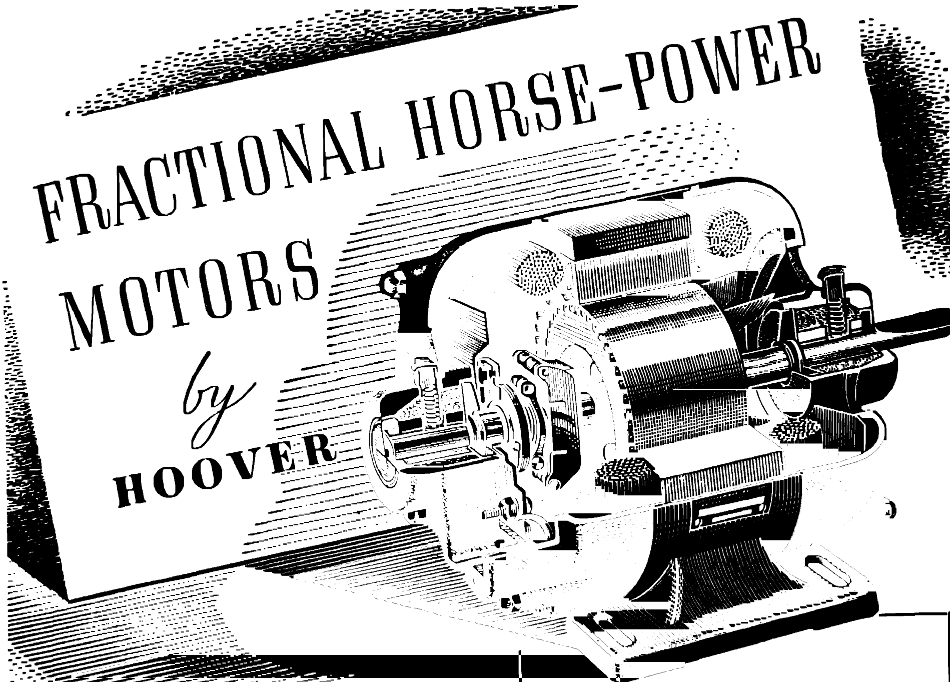

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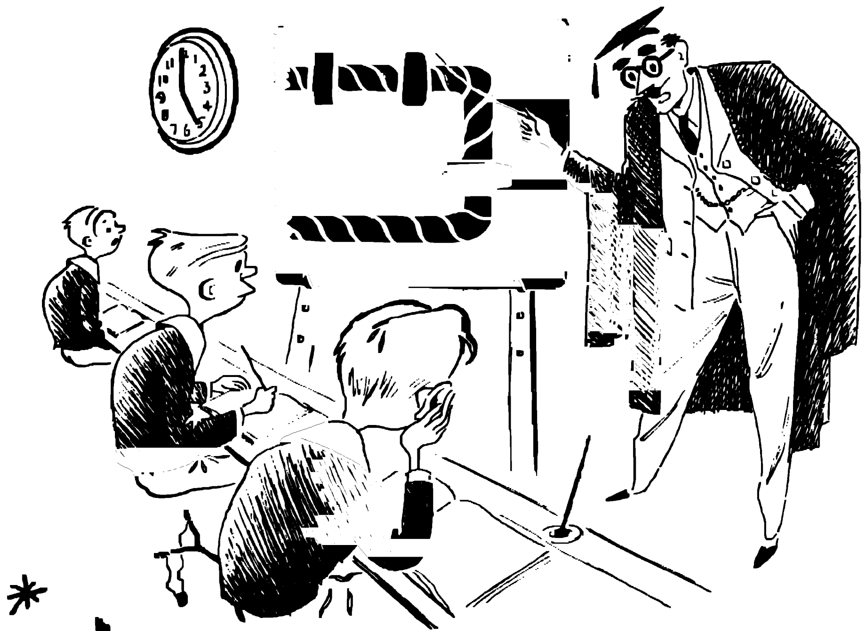

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Most likely your heated surfaces *are* lagged. But are they all lagged *efficiently?* Are regular checks carried out to ensure that insulating material is in good condition everywhere — including that dark corner where the pipes can't be reached without a ladder? Is the thickness of the material sufficient for the temperature of the surface it covers? Are you sure that flanges and valve bodies have not been left naked to make maintenance easy? The heat loss from a bare flange may be as much as that from a foot or more of bare pipe.

Proper lagging of boilers, cylinders, steam pipes and other heated surfaces pays the highest dividends in fuel efficiency for very little capital expenditure. Fuel Efficiency Bulletin No. 2 published by the Ministry of Fuel and Power is a little mine of information concerning this. The Ministry's Regional Office will gladly send you a copy if yours has gone astray.

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Northern	Government Buildings, Ponteland Road, Newcastle-on-Tyne, 5	Newcastle 28131
North-Eastern	Century House, South Parade, Leeds, 1	Leeds 30611
North-Midland	Castle Gate House, Castle Gate, Nottingham	Nottingham 46216
Eastern	Shaftesbury Road, Brooklands Avenue, Cambridge	Cambridge 56268
London	Mill House, 87/89, Shaftesbury Avenue, W.1	Gerrard 9700
South-Eastern	95, High Street, Rochester	Chatham 3487
Southern	Whiteknights, Earley, Reading	Reading 61491
Wales	27, Newport Road, Cardiff	Cardiff 9234
South-Western	12/14, Apsley Road, Clifton, Bristol, 8	Bristol 38223
Midland	Temporary Office Buildings, Hagley Road West, Birmingham, 17	Bearwood 3071
North-Western	Burton Road, West Didsbury, Manchester, 20	Didsbury 5180-4
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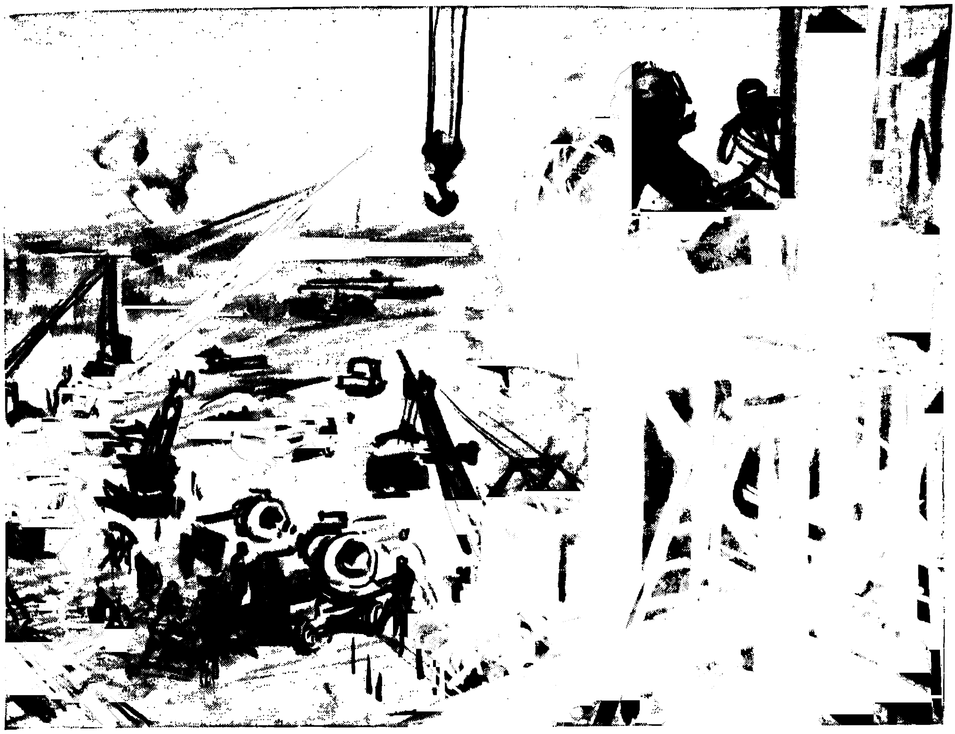

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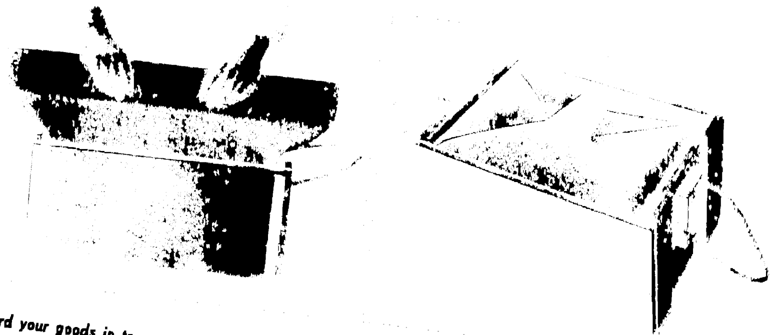

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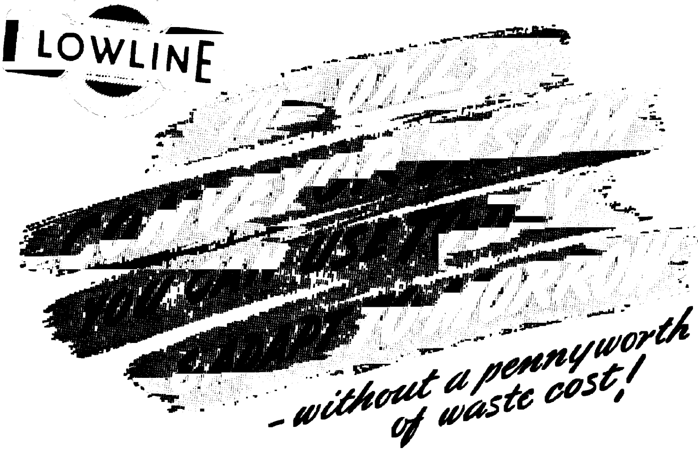

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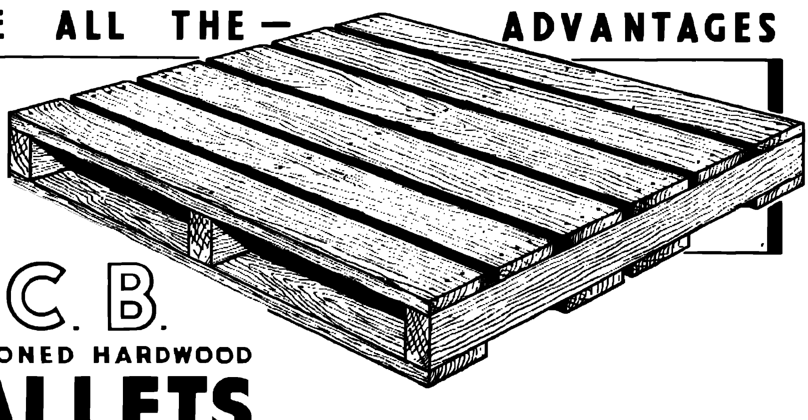

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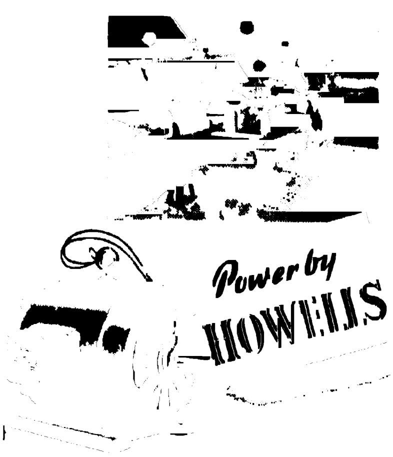

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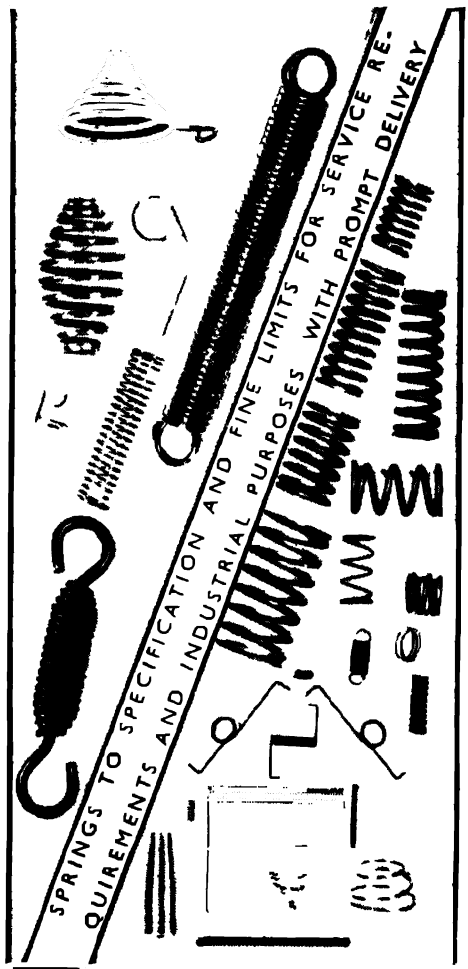

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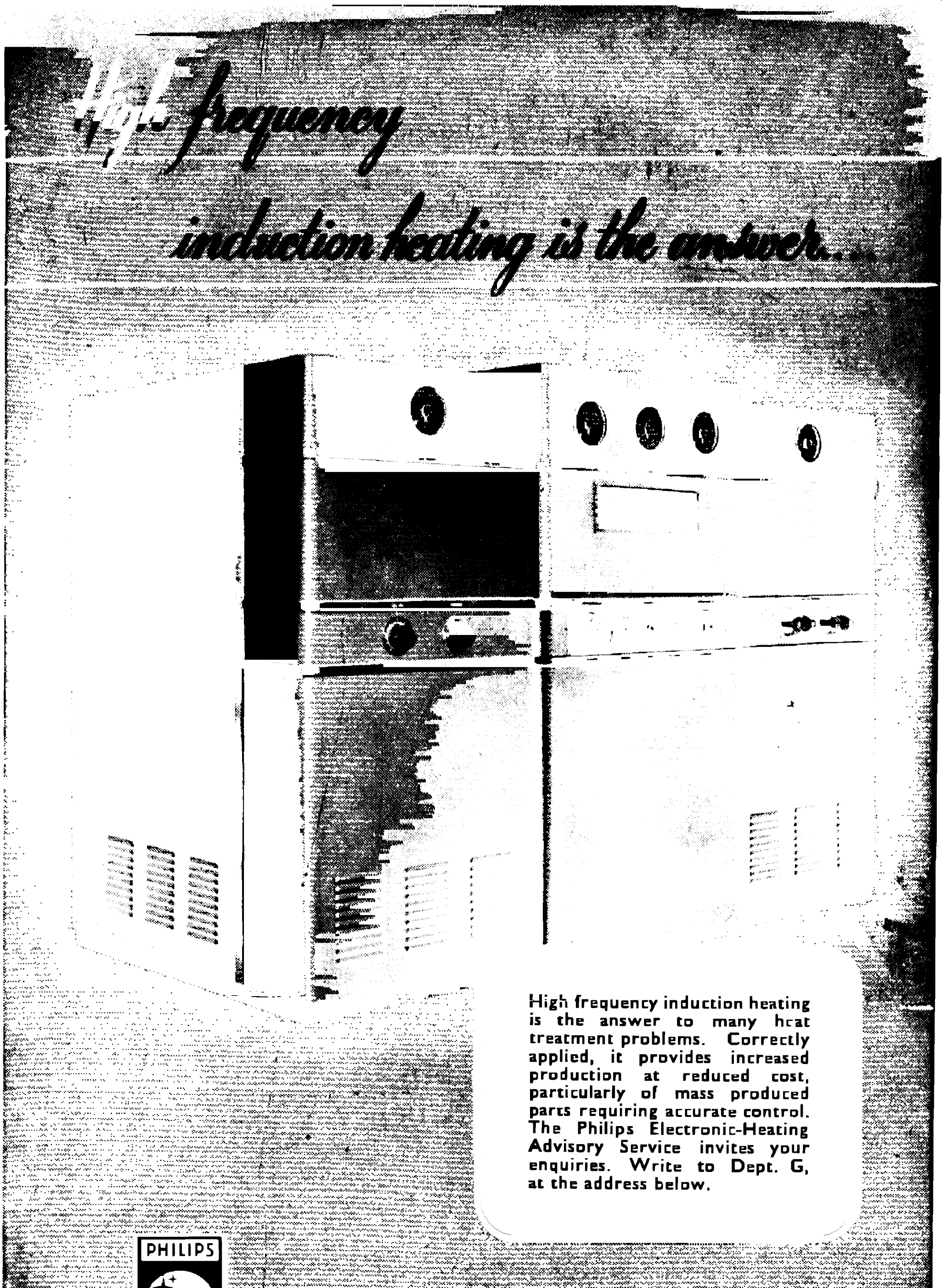
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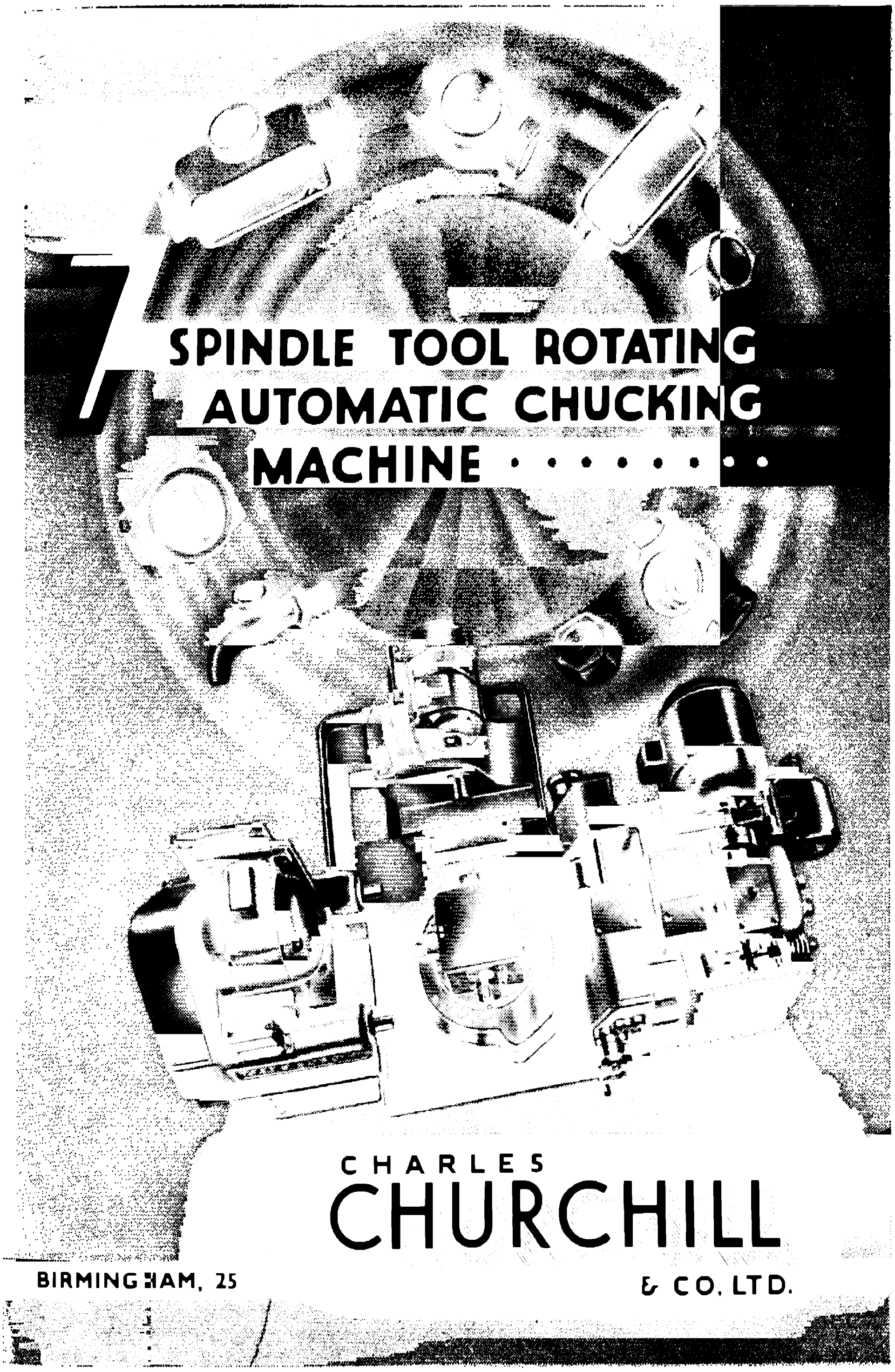
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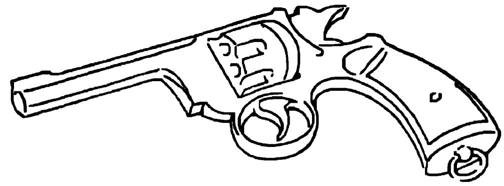

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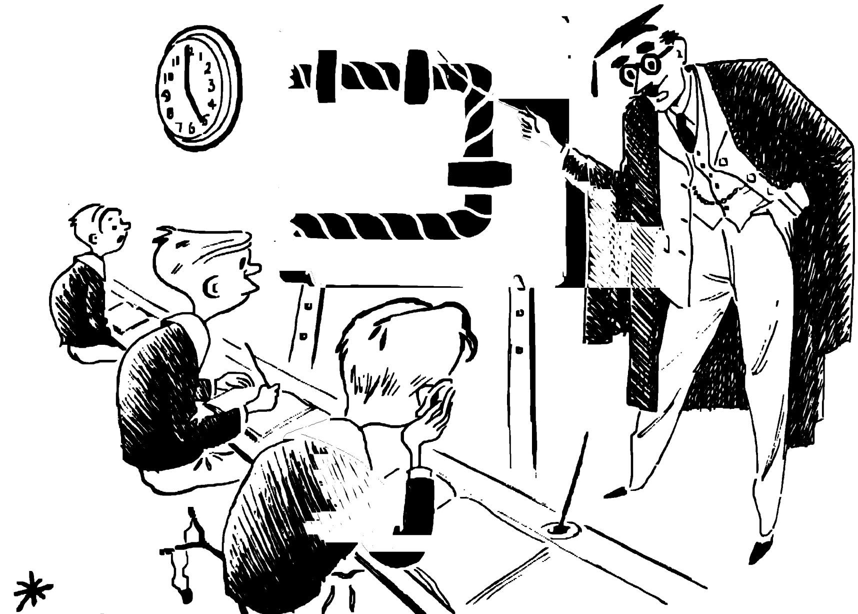

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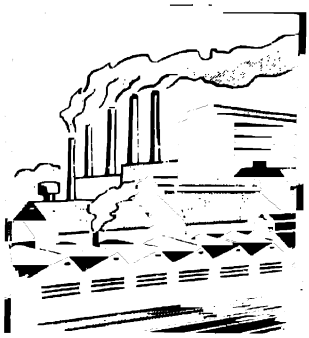

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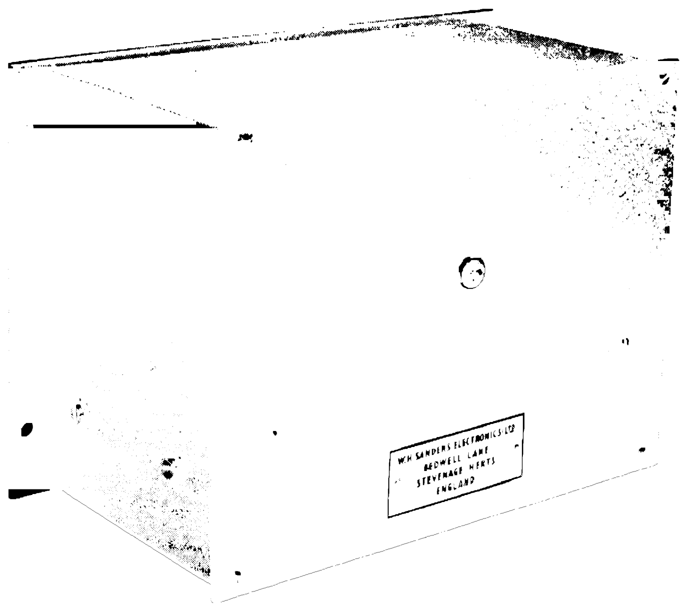

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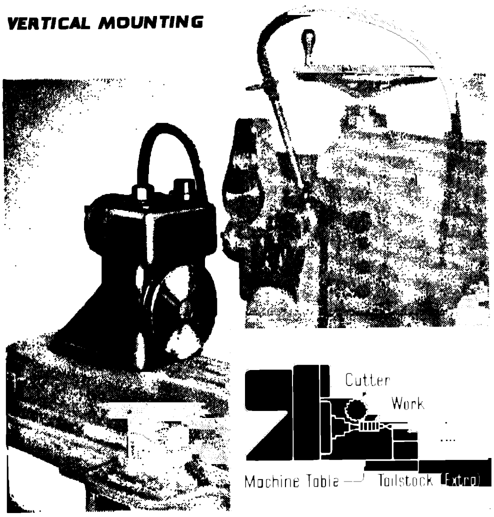

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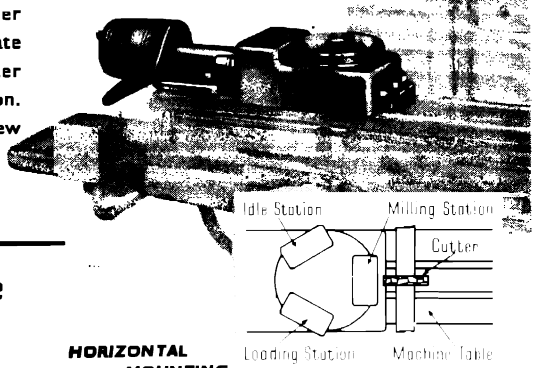

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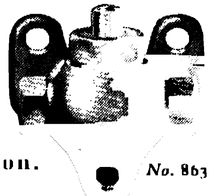

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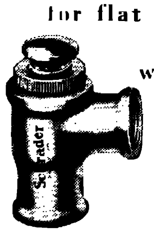

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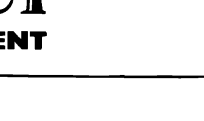

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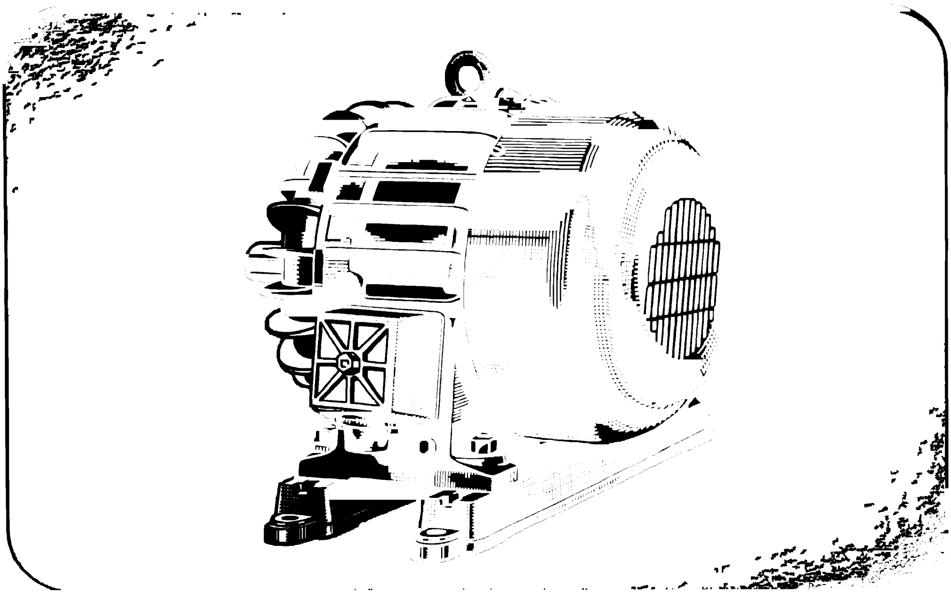

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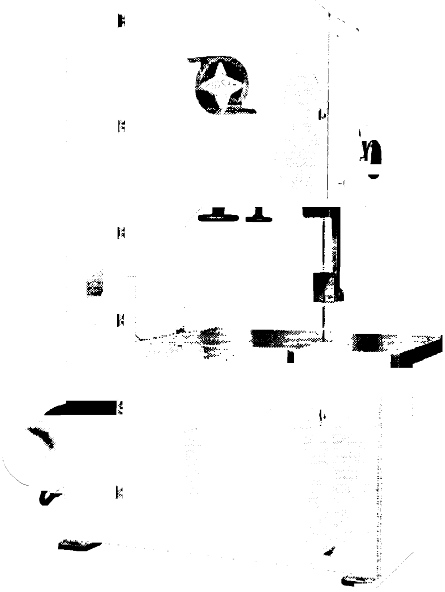

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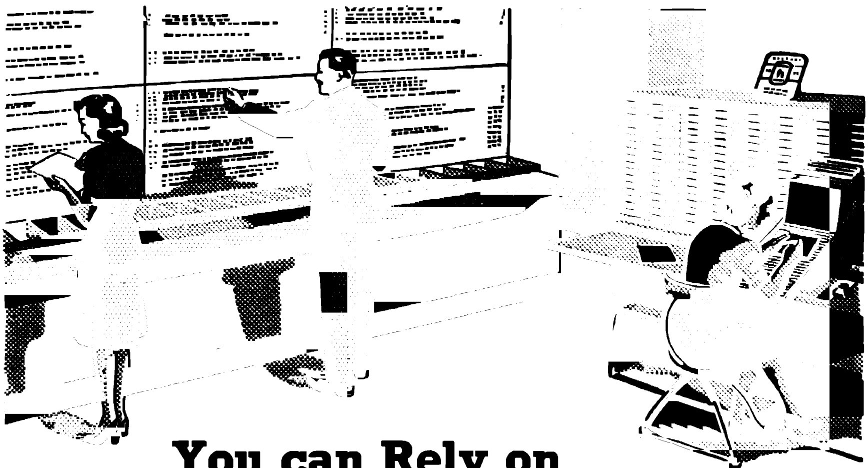

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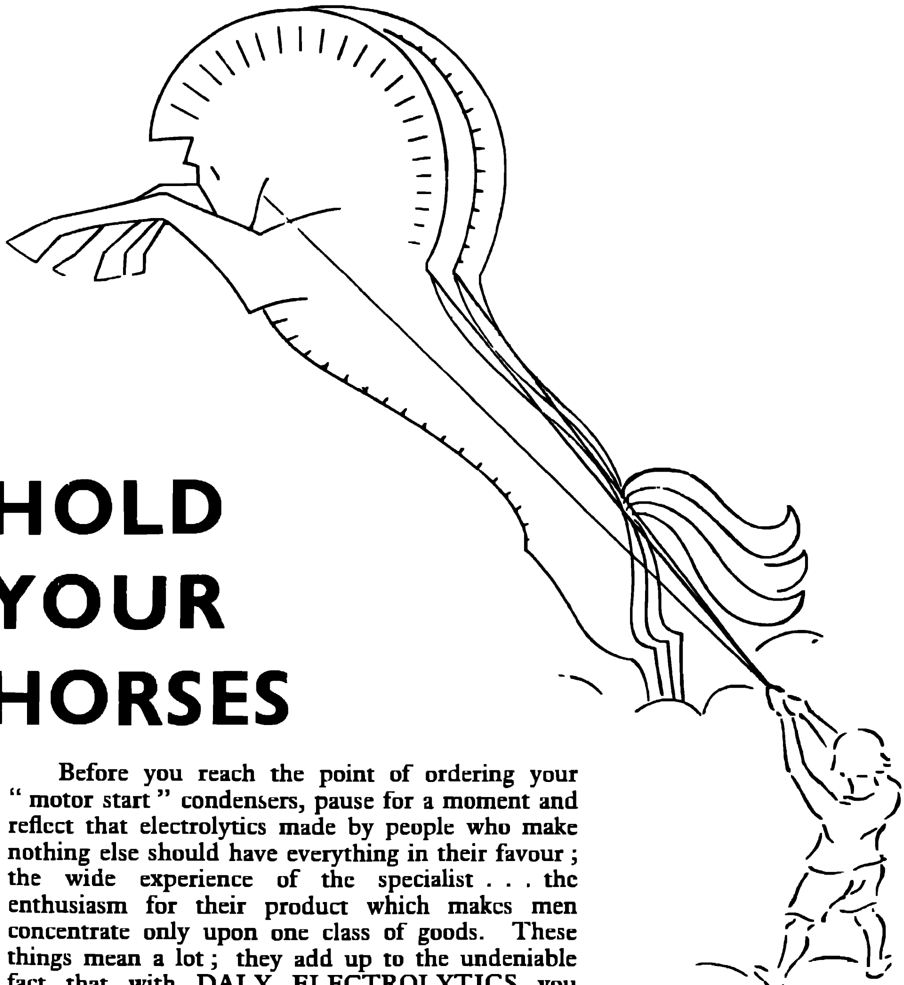

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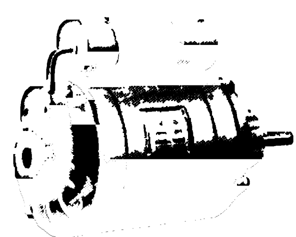

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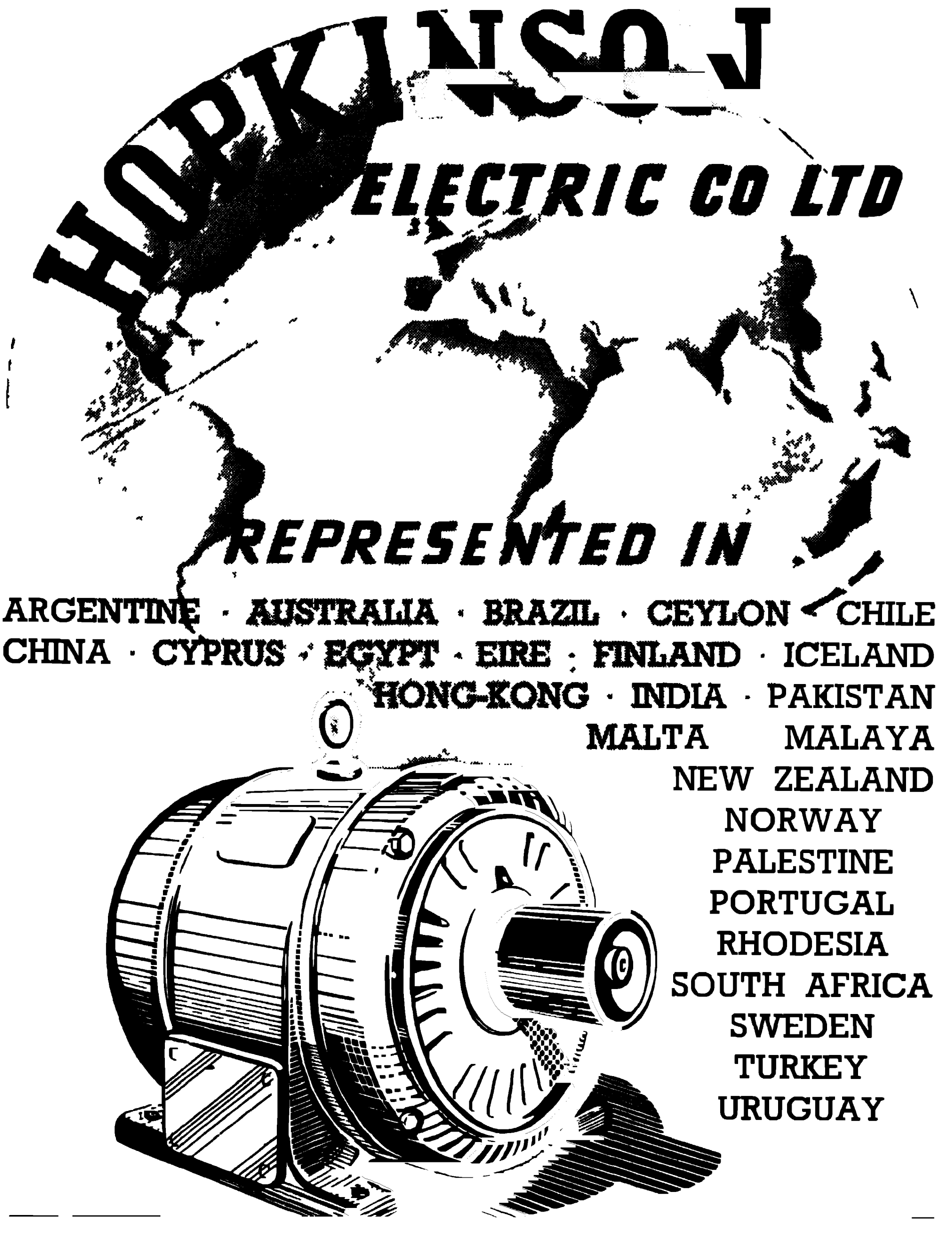

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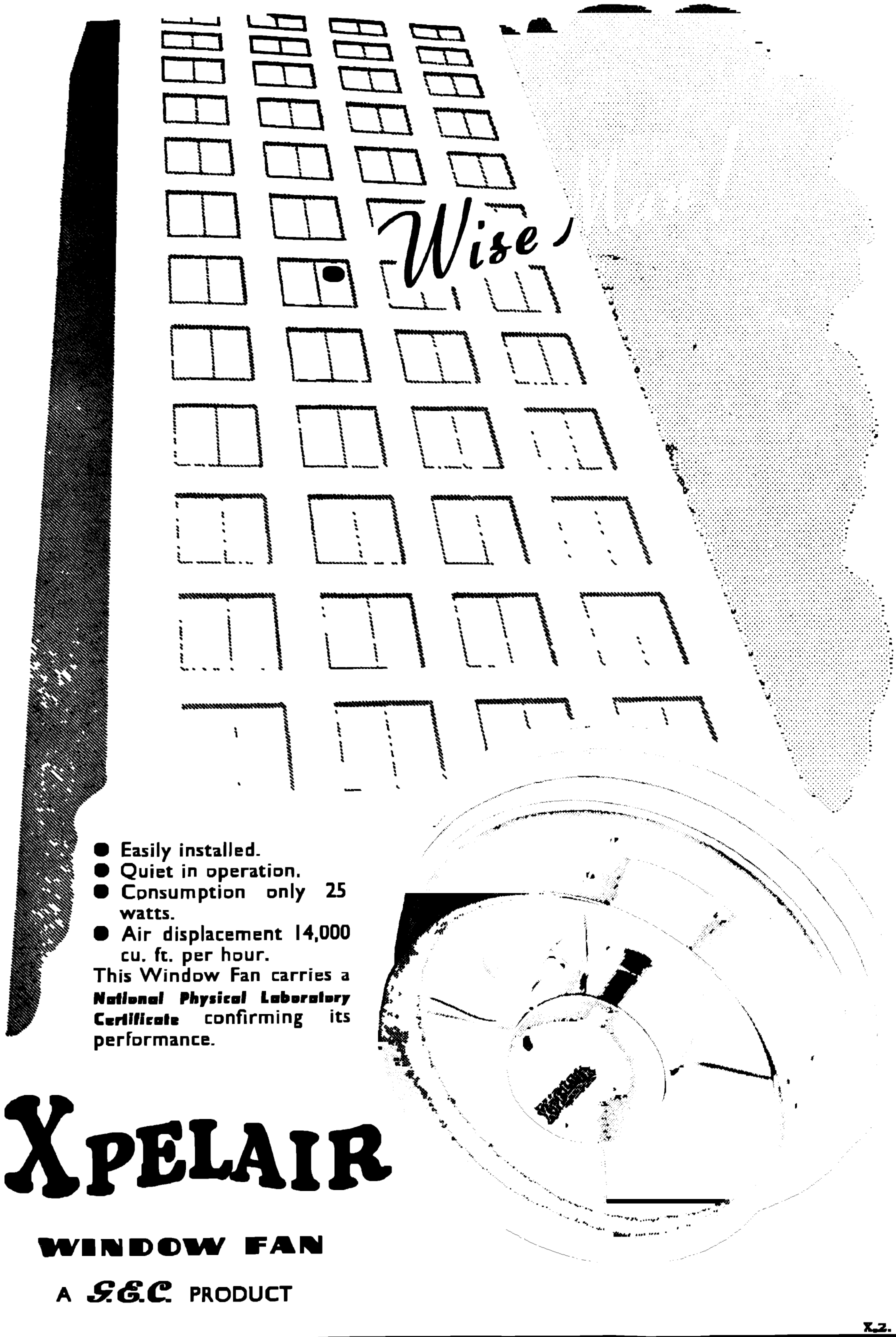
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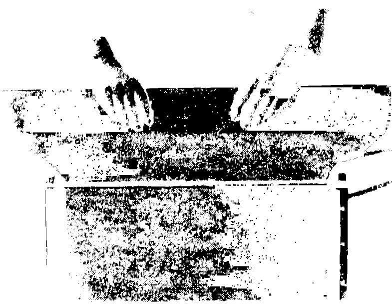

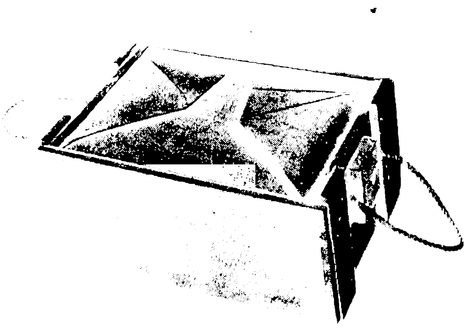

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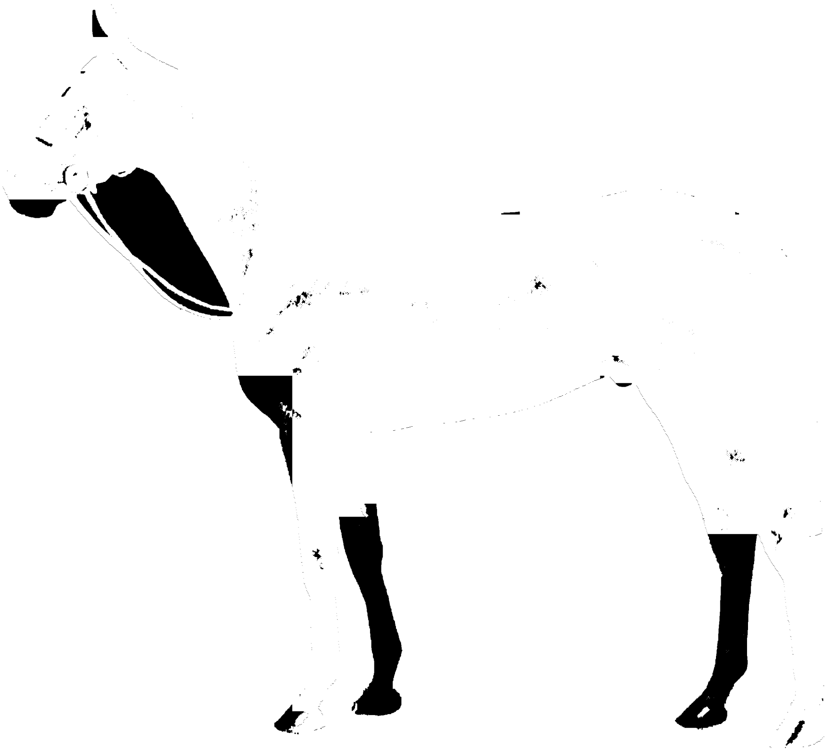

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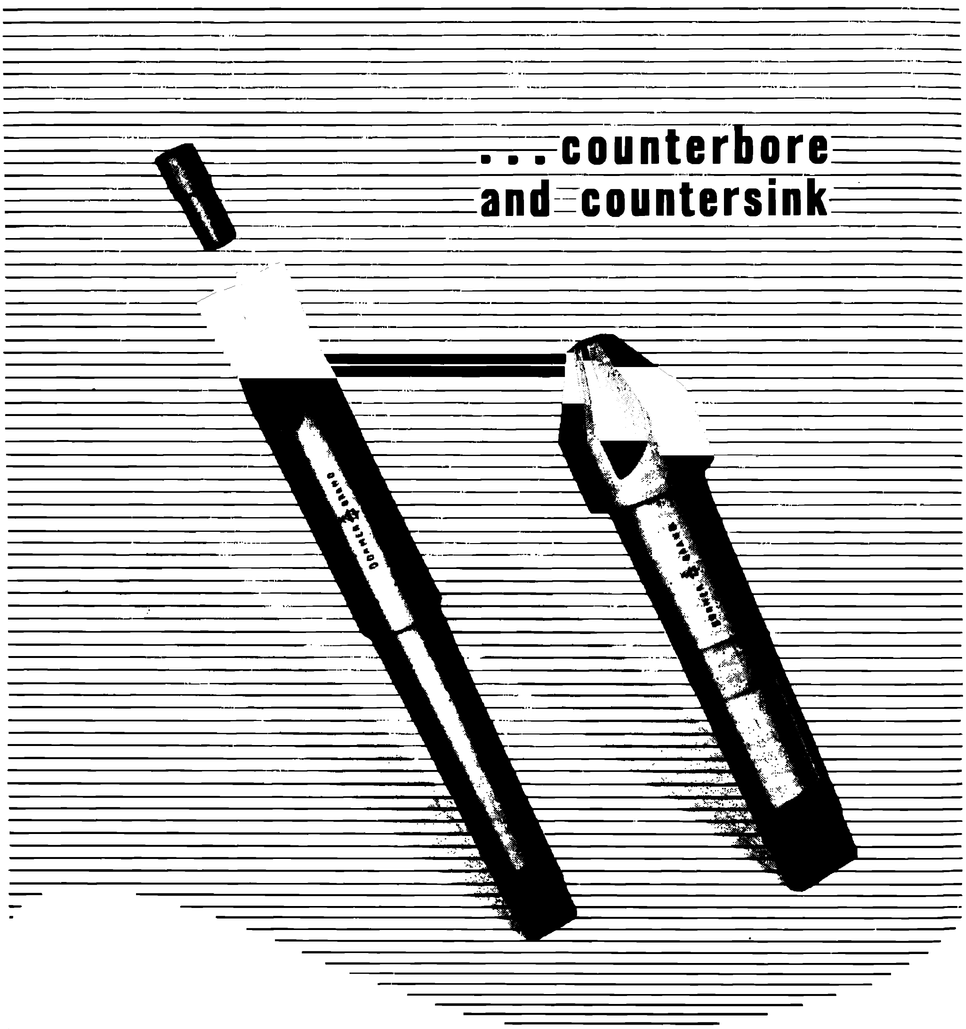
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Mass Production

1/6d. 20/- per annum posted — APRIL, 1948 — Vol. 24 No. 4

THE SHAPE OF THINGS TO COME

OVER the last three years, our economic situation has presented the one consistent factor in world which has been treated to a riot of contradiction and confusion. It has become steadily worse ! We have now drawn the last £25,000,000 of the American loan. In terms of finance, that means that we have about £550,000,000 in gold reserves, we can draw £30,000,000 from the International Monetary Fund in the next five months, and a further £80,000,000 from the same source in the following year. However, as the drain on our assets has been running at something like £600,000,000 a year, the Fund withdrawals are negligible. The gold has to meet the demands of the whole sterling area. By any standard, that leaves no doubt about the economic situation. Next comes the crash—in spite of our depressing optimists who think that the Marshall plan will straighten out the British Empire overnight. The Marshall plan—which allocates £440,000,000 to Britain in its first 15 months—is no sudden rain of manna from American Liberators. At best, the plan will give us breathing space by easing the dollar situation ; but if we pant through it as we did through the loan, we shall be just as exhausted 15 months hence as we are now.

The economic situation, therefore, is as simple to assess as it is drastic. Shorn of its mass of economic jargon, the position in Great Britain is that nearly 50,000,000 people are marooned on a small island capable of supporting, at most, 20,000,000. Officially, of course, that moment—the crash itself—has not yet arrived ; but no one with a vestige of intelligence believes that it is anything but inevitable. When it does burst on us, there will be such a political scurry in search of scapegoats that the country will resemble a jungle overrun by a hunting expedition gone berserk. Scapegoats must be found—by every politician who does not keep a small supply in his emergency kit. And, since the catastrophe can be pinned on the export problem in some way or other and especially as our exports have failed to reach panic targets, the scapegoats in this wilderness will be British industrialists.

They are, of course, the obvious quarry. To quote the latest Labour Party pamphlet, " Britain pioneered the industrial revolution, and for a long time led the world in productivity." We were, in fact, the greatest industrial nation—until 1945. The argument, therefore, will be that since we are a great industrial power no longer, British industry has failed. British industry, then, is the culprit who has made us bankrupt, squandered the money loaned to us by our friends, and brought us down to the status of a nation in distress—a nation in debt—a nation in despair. Well, we are in debt and we are a little distressed internally—a little economically bilious.

But we are certainly not in despair, and it is definitely not British industry that has upset the national economic health. The British industrialist has faced crises before. And this time he has been doing what he has always done, steadily gone on working while his contemporaries, the politicians and the self-appointed industrial experts, have been screaming their heads off about his shockingly early end.

His achievements at the moment, for example, show a remarkable vitality. He even passed some of his own records at the beginning of this year by exporting 146,000 bicycles, 69,000 tons of machinery worth £19,500,000, also 6,695 motor cycles, and 14,593 motor cars, among other things. His steel production reached an annual rate of 15,000,000 tons, the highest figure recorded in February; cotton exports are expected to reach one hundred million yards in 1948 as against ten million in 1947, and the total volume of overall production was nine per cent. higher in 1947 than in 1946.

All that has been done by British industry in spite of some formidable handicaps. The Government, for instance, scrapped the Liverpool Cotton market, controlled the raw material buyers and finished product salesmen almost out of existence, substituted the Civil Servant with his bundle of forms for the merchant with his wealth of experience. It invited exploitation by bulk-buying, turned profit into loss by nationalising industries, and offered the nation an elaborate State Health Service—minus doctors or dentists—but did nothing to provide the majority of them with anything worth calling a home. In short, while theorists have riddled our industrial structure with worm-holes, the industrialist has not only been replacing the rotted members but has gone on building. When, as the scapegoat, he has borne all our unprofitable amateurs into obscurity, he will resume his task. And he will go steadily on with what he has been doing all the time—rebuilding the nation that once "pioneered the industrial revolution, and for a long time led the world in productivity."

REDUCING PRICES AND PROFITS

Within the month stipulated as a limit, the British industrialist, represented by the F.B.I. and other organisations, has laid before Sir Stafford Cripps his plan for voluntary limitation of profits and prices. It has been recommended that immediate action be taken and the scheme maintained for at least a year. The proposals, in spite of the speed with which they have had to be prepared, are level-headed and substantial, Summarised, they are :—

1. To reduce prices by securing maximum output with existing plants.
2. To fix current prices as a ceiling, with quality unaffected.
3. To peg dividends at the level of the last financial year.

Obviously, industry does not pretend that these measures will either solve the crisis wholly or be anything more than interim action. But in the midst of all the depression and confusion consequent on the "Black-Paper," they show how shrewdly and concisely industrialists have diagnosed our economic sickness. There are many who will say that this diagnosis could have been made earlier, indeed might never have been necessary, had the Government sought the advice of industry on other matters instead of issuing arbitrary and often unworkable decrees. It is therefore an encouraging sign that the Government has at last thought fit to seek advice on an issue of vital importance to the nation.

The answer of free enterprise, in this new plan, has been to promise to do everything possible to increase production and at the same time to forego the advantages of that increase. The same standard must hold for State "enterprises." A further rise in the price of coal or transport would simply nullify the efforts of private industry to reduce its own prices. The plan is not magic—nor would it be anything but harmful in permanent operation, says industry. It is, however, a sensible plan and, most important, a volunteer plan. It is worth ten—or ten thousand—doctrinaire expedients pressed into unproductive service. The Government has not wasted its time in calling on industry for wise counsel.

Current commercial and political trends affecting industry

TRENDS

SEVERAL chapters were added to the economic and industrial history of Great Britain during the first quarter of the current year. The starkest and most realistic facts were disclosed and our National plight was put on a level worthy of its gravity. A chill was awakened in us all by the White Papers and cold douches have since been imparted by Ministers in their deluge of speeches. Under the impelling influence of the Government, profits, wages and prices are now linked to the country's economic programme and target technique.

One must, with Janus, doubt the wisdom of our Ministry's advice in all things. They have made their political phylacteries so broad that their eyes are covered; they have followed a double-decker policy, part based on tackling post-war problems and part on their Nationalisation fetish. But no one is so foolish as to refuse to acknowledge the desperate state of affairs. The difficulty is to enforce Draconian legislation necessary to check further deterioration. The cure for our present critical state is greater and cheaper production, which promises to come about with the combination of influences now at work coupled with the Government's self-denying ordinance.

The shadow of the Budget is beginning to loom largely and the big surplus calculated to be shown is one of the best defences against inflation. So likewise is the halt in the wages spiral which labour has agreed to, conditional on the adoption of measures to check rises in profits and dividends. But the Chancellor is not expected to impose legislation likely to hinder industry. Capital as well as labour has a vital part to play in the National economic survival. And however unwise it may be at this critical juncture to raise the rewards of either, national revival would not be assisted by a policy which stabilised the rewards of one side and reduced those of the other.

THE Government's revised scheme for the distribution of Iron and Steel is in its essentials the old scheme in a more stringent form. Owing to over-optimism and also to a time lag between the granting of authorisations and the placing of orders, actual authorisations were in existence for some two million tons more steel than was available. Essentially the new scheme seeks to restore the situation by a withdrawal of the old inflated authorisation currency of " M " forms and the introduction of the new I.S. Authorisation currency. The new forms took effect from the beginning of period II on 1st April. And in order to tighten up the administration of the scheme, it has been made an offence to place orders for more iron and steel than the quantity authorised on the I.S. form for each period.

Apart from these changes, the main outlines are the same. The principal consumers of steel—and there are 6,000 on the books of the engineering branches of the Ministry of Supply alone—have still to notify in advance their demands to the appropriate departments. And these demands are to be matched and scaled down to supplies by the Raw Materials Committee. Steel will then be allocated to the consumers on the new forms and they will authorise their sub-contractors within the limits of their own allocations. From the total steel output this year, exports are estimated to call for nearly 1,000,000 tons. In many of the bilateral trade agreements, which have been made, we have definitely agreed to offer quantities of steel and steel goods. Requirements for export in the form of machinery, vehicles and other manufactured articles have been estimated at a further 2,000,000 tons.

IS Britain a jump ahead of the rest of the world in the development of the gas turbines? Government plans for the expansion of research in this direction are believed to be of a long-term nature. But in view of the present state of affairs should it not be promoted to the forefront of activities? Research work is going on at Farnborough but it is not possible to define the programme or state the cost. It is said that the development of the gas turbine is a greater immediate contribution to world progress than atomic energy. Experimentalists who have worked on the gas turbine engine are confident that they have been handling the greatest motive power ever known. It could be applied not only to aircraft, ships and railways, but to industry generally.

The prototype of a gas turbine engine designed by an American engineering company for use in motor boats is shortly to be tested in a car. Although it has a length of only 42 inches and a diameter of 22 ins., it has developed 200 h.p. in bench tests. With the gearing necessary, when used to propel a car, the engine weighs 140 lb. A British scientist has carried out some research for the constructors in this experiment and at least one motor manufacturing firm in Britain has a small gas turbine engine under development. It is generally conceded that engines of this type, with their potential advantages of exceptionally smooth running, simplicity and yield of great power for size and weight, will ultimately replace the ordinary piston engine.

News and views of men who lead

QUOTING the

Textiles operatives frown on overtime

RT. Hon. Lord Barnby, C.M.G., C.B.E., M.V.O., Chairman of Bolton Spinning Company, Limited :—

In keeping with most textile mills in Lancashire, there is no ready response to the working of double shifts or overtime. This is disappointing, in so far as the Government is stressing the need for extra production. It is hoped that all operatives will realize the necessity for such increased production in the present national emergency. On the other hand, it is particularly important that production costs are not too high.

We are spinners of fine quality dry-spun worsted yarns, for machine and hand knitting, and for weaving. Our main overseas competitors operate in Belgium, France, and Italy, and in these countries worsted spinning machinery has already attained full pre-war activity, and in some cases has exceeded pre-war volume. In all these countries, two or three shift operation is the rule, as is also the case in Yorkshire for dry spun yarns, and in consequence yarn production is increased and overhead costs are proportionately reduced.

Frustration pervades industry

SIR MICHAEL NAIRN, Bt., Chairman of Michael Nairn & Greenwich, Limited :—

A flourishing home market used in times past to be regarded as a prerequisite for a thriving and expanding export trade, and we trust it will not be long before we are in a position to deal in a more generous manner with the domestic situation. While making our contribution to the Government's export programme, we will at no time be unmindful of the pressing needs of our customers at home.

At last year's annual meeting I referred to the feeling of frustration which then permeated all our endeavours. That feeling, unfortunately, persists to-day and continues to handicap us in a wide variety of ways, but more particularly in regard to our development schemes, which both in the national interest as well as in your interests should, we suggest, be proceeded with as speedily as possible.

Here again the Government did not appear to realize until quite recently that capital expenditure of an unproductive nature should not be embarked upon indiscriminately at the present time. Realizing the serious position in which the country now finds itself and although we have several large schemes for development in view, we have delayed proceeding with these because of this difficult economic situation. We have, however several schemes in an advanced state of completion which, if we were allowed to finish them, would enable us very considerably to augment our present output. These have been delayed owing to the difficulty of obtaining licences for some comparatively small ancillary details.

No lack of faith

MR. A. HAROLD BIBBY, D.S.O., D.L., Chairman of Martins Bank Limited :—

This has been a year of crisis, which is nothing new in the history of this country and, as we know from past records, we have always survived such storms and eventually reached calmer waters after disagreeable buffetings. Consequently, there is no lack of faith in the country that on this occasion also in the end our troubles will be successfully surmounted. Possibly this is a justifiable assumption on the part of the people who passed safely through the Battle of Britain when, to foreign eyes, we appeared to be in an impossible position. Unfortunately, however, the seriousness of the present crisis, which in some respects is more ominous than any previously experienced, is not apparent to the generality of the people of these islands. Certain sections of our people find it extremely difficult to appreciate that there is any crisis at all. To some there seems nothing the matter with the economic position of the country as there is still no general difficulty in selling goods or services at home and money is plentiful. By exercising the normal pressures available to them in a state of full employment, others have obtained a five-day week, holidays with pay, and better food rations than their fellows.

It is highly proper that the country should be made to understand the futility of any section of the community seeking to improve its position permanently at the expense of the rest, without proportionate increase in production.

The economic limits of such processes are set by the productivity of the 20,000,000 people who constitute the working population of this country. The activities of these workers have to be allotted between defence requirements, the maintenance and expansion of our capital equipment, and the output of consumption goods. Defence unfortunately entails a larger call on man-power than before the war. Our capital equipment suffered damage and deterioration during the war and, if we are to rehabilitate ourselves as a leading industrial

Chairman

nation and re-establish the conditions for a rising standard of living, we should devote a larger proportion of our efforts than before the war to the tasks of real capital creation. If adequate provision is made for defence and capital creation, it is only the remaining labour force that is available for the supply of the consumption goods which determine the contemporary standard of living. These three major fields of demand—defence, capital creation, consumption—are competing claims on the national effort and, given no increase in productivity, expansion in one field can only be at the expense of contraction in the other fields. This inexorable fact has manifested itself in the past year and it will manifest itself still more strongly as the aid from abroad, furnished by the loans from the United States and Canada, tapers off to vanishing point. We may mitigate the situation temporarily by sales of gold and purchases of dollars from the International Monetary Fund, but these expedients are fleeting in their effect and duration.

South Africa depends on British goods

MR. MICHAEL MILLER, Chairman of O.K. Bazaars (1929) Limited. speaking in S. Africa :—

The present high cost of living is being viewed with apprehension in most countries of the world ; efforts to curb the post-war inflationery tendencies have not as yet succeeded. Prices to-day are still at the peak, although there are indications that levels are beginning to break in certain commodities.

South Africa depends to a large degree on oversea merchandise, most of which before the war came from the United Kingdom. After the war Britain's exports to South Africa fell short of the demand, and we had to supplement our importations of essential supplies by increasing our buying in other markets. Our dependence in recent years on these goods has undoubtedly added to South African living costs.

I have just returned from Britain, where the export drive is in full swing. The production figures in all branches of British industry are rising, and I hope that South Africa will receive her full share of the growing volume of goods leaving British ports. I have no doubt that if British merchandise reaches the Union in quantities comparable with pre-war figures, the rise in the cost of living in this country will be checked. I refer, of course, not only to fabricated goods, ready for sale, but also to raw materials and half-finished products for use in South African factories.

Shorter working week illtimed

SIR THOMAS D. BARLOW, G.B.E., Chairman of District Bank Limited :—

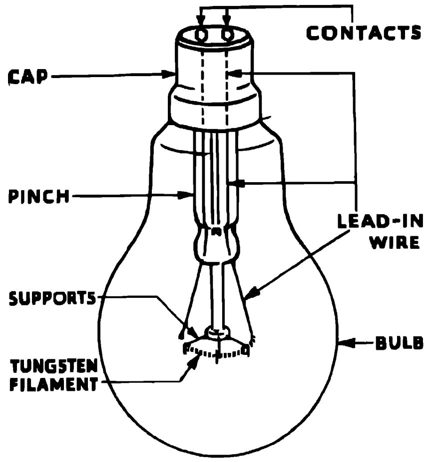
Although we can clearly see the sequence of past events, do we realize the economic consequences of our recent actions ? When it was imperative that the country should increase its output in order to redress its international trading position and also make good domestic shortages, and when, because of this, there was full employment and full order books, we introduced the shorter working week. What could have been better calculated to produce an atmosphere of false prosperity, and what could have made it more difficult for others than the well informed to realize the critical situation confronting the nation ? Indeed, one cannot but consider whether it was wise, when the country was exhausted by a terrible and prolonged war, to embark upon far-reaching schemes of a difficult and complex character when even their protagonists could only claim that the benefits were of a long-term nature. All are agreed that social security and full employment are desirable objectives, but can these be achieved except under an authoritarian system of direction ? An optimistic view is perhaps permissible, but the difficulties and dangers cannot be ignored.

Nero fiddles

MR. J. DOUGLAS BROAD, Chairman of The Debenture Corporation Limited :—

I find it very difficult to reconcile the advice of our Ministers—increase output and reduce costs—whilst at the same time they are continually authorizing increase in wages and shorter hours of labour. With all possible good will towards a better standard of living, I cannot help feeling that the method by which this is sought to be obtained is based on a wrong principle. It would be better, in my opinion, to try to attain this end by building up and not by the present policy of pulling down.

There always seems to me one very important factor to which attention is insufficiently paid—the study of market requirements. We are still much too prone to stress what we want to sell and to assume that buyers must want our goods. The nationalization policy of the Government continues unabated, despite repeated warnings of immediate financial danger. " Nero fiddled whilst Rome burned."



THE MASS

These are the technical names of the parts of the lamp. They are used for reference in all captions on the following pages.

Continuous checks are made during production to make certain that the lamps conform to specification with respect to light-output.

very important factor of production is the availability of light—where it is wanted, when it is wanted.

The modern device which provides this requirement, the incandescent tungsten electric lamp, is so common-place that it is taken for granted. Its manufacture, however, constitutes one of the most complex and fascinating stories of mass production that can be told.

PRODUCTION OF LAMPS

THE historical development of the incandescent electric lamp is interesting, but for our purpose here it must, of necessity, be given very briefly.

Such lamps have always depended for their functioning upon the ability of some substance, in filament form, to glow brightly when an electric current is passed through it. It is also essential that the brilliance of the glow should be able to be maintained through a useful length of life before the incandescent material is destroyed by combustion or volatilisation. Quite obviously these conditions could not be fulfilled if the glow took place in air, since the oxygen in the air would immediately combine with the incandescent medium, support its combustion and so hasten its destruction. A vacuum or an inert gas does, however, provide the required conditions.

So we find the first commercially produced lamps, which appeared about 65 years ago, having a thread of carbonised vegetable matter glowing in a vacuum.

After this came the Tantalum lamp, with a metallic filament in place of the carbonised vegetable thread—but still in a vacuum.

Next, the Tungsten wire was produced. This was immensely strong and could be raised to almost unbelievable temperatures—again in vacuum.

All these early lamps had straight (non-coiled) filaments.

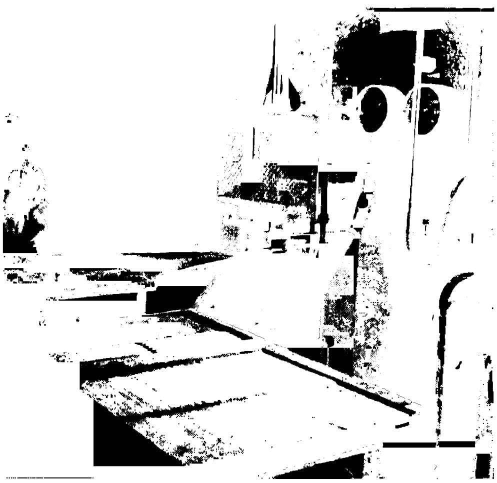
About 1919 research made two more great contributions to the progress of lamp evolution. It was found that the Tungsten filament could be coiled into a minute spiral and an inert gas could be introduced in place of the vacuum. Both of these changes permitted the running of the filament at even higher temperatures than hitherto, which meant that a greater output of light could be achieved with no increase in the consumption of electricity.

Research and mass production methods have been combined so that to-day incandescent electric lamps can be produced in the vast quantities in which they are required, and yet the high consistency of characteristics that modern standards demand is maintained.

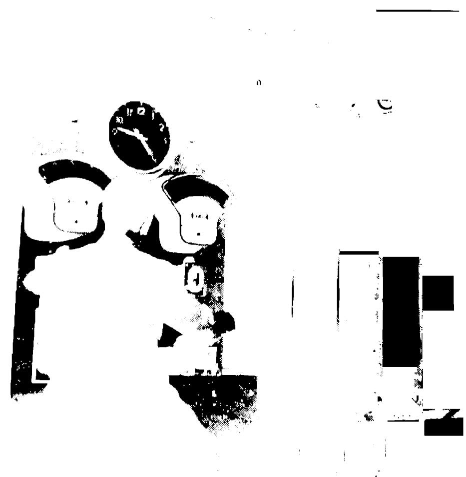
The photographs which follow were taken at the Osram Lamp factories of The General Electric Co., Ltd.. and depict some of the more vital processes in the production of Osram electric lamps, though it must be emphasized that there are dozens of other subsidiary operations involved in achieving the ultimate result.

The majority of the specialised machinery shown in the following photographs was designed and built by Osram — G.E.C. engineers.

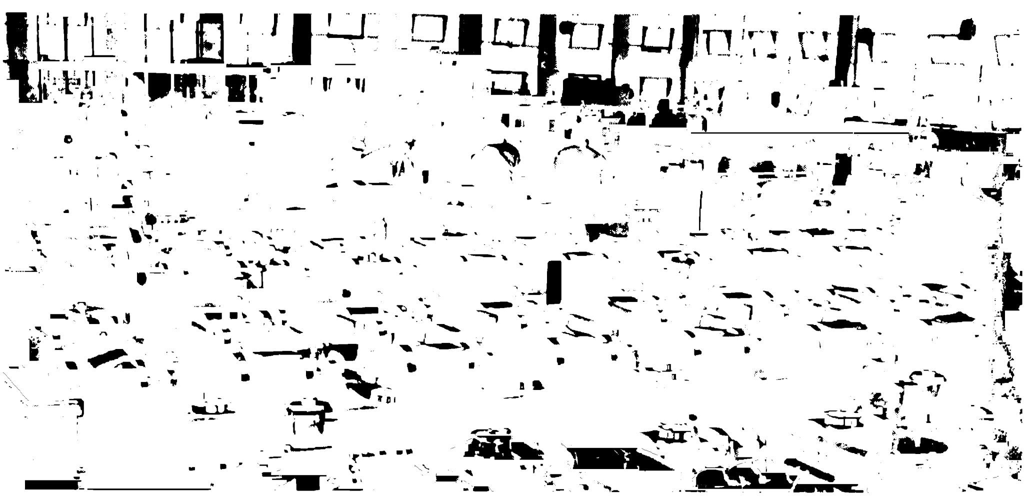
3—From the pans seen in the last photograph the dried Tungstic Oxide powder is placed in furnaces to remove water-vapour and any other volatile constituents.



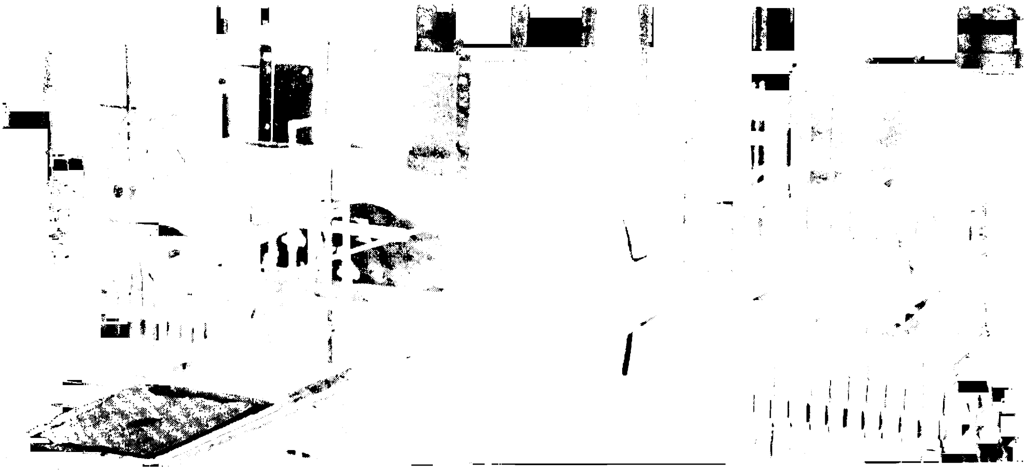
5—The operator is filling Tungsten powder into a mould, to be placed in the 200 ton hydraulic press (right). Pressed bars in the foreground are produced by this process.



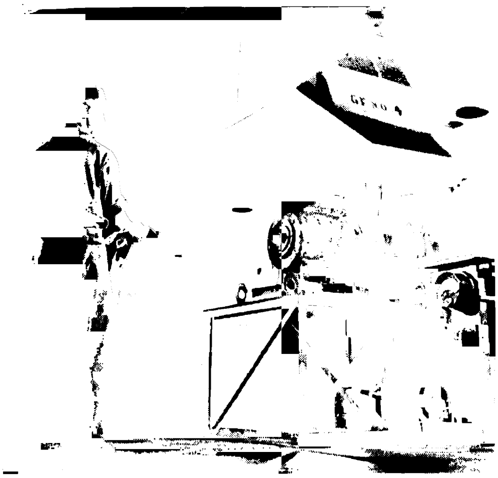
6—A pressed bar is placed in each of the cylinders (right), and the metallic particles are fused together by the passage of a heavy electric current through the bar.



9—The finer stages of wire-drawing. The product of these machines, and those in the next picture, is converted into filaments.



4 - The powder is now passed slowly through these ovens, in an atmosphere of Hydrogen. The Oxygen in the oxide is thus removed and metallic Tungsten powder remains.



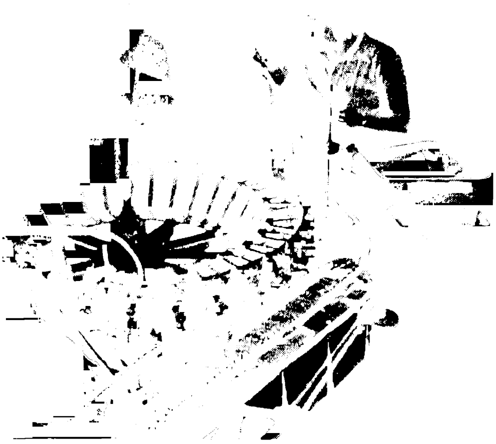
[illegible] The bars are now hammered in [illegible] at high temperature, [illegible] form. The operation is repeated [illegible] the desired diameter is reached.

9. When sufficiently small, the rods are repeatedly drawn through special dies to further reduce their diameter. The rods are now [illegible] wire.

10 - The finest sizes of wire are drawn on these small machines. One of the bars shown in picture 5 yields up to 30 miles of these very fine wires.

11—This machine is welding the nickel copper and other metal components of the "lead-in" wires, which connect the lamp cap contacts to the filament.

12—These high-speed, multi-head coilin machines are winding the tungsten wi on to a metallic core to form a continuo spiral about 1/50th in. diameter.



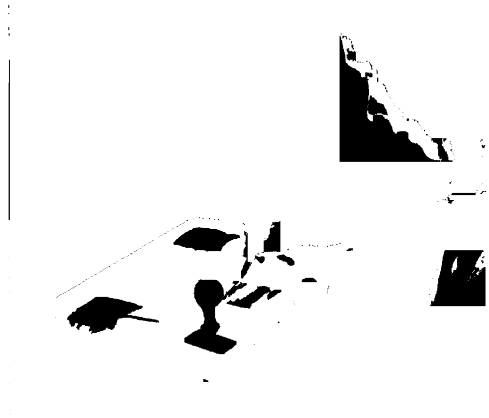
15—This machine is making the "pinch," the internal structure of the lamp, from prepared glass and metal parts.

16—Here the filaments are being attache to the "pinches." Completed "mounts in right foreground.

19—Bulbs are being sealed over the "mounts" (right) then transferred to the pump (left) which removes all air and fills the bulb with Argon gas.

20—This machine cements the cap to the lamp and solders the lead-in wires to the cap-contacts.

[illegible]



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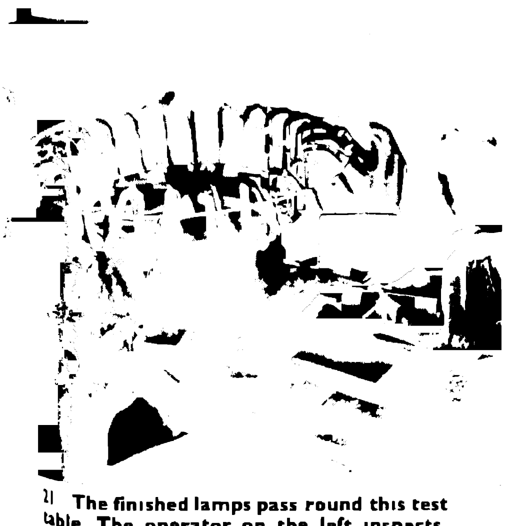
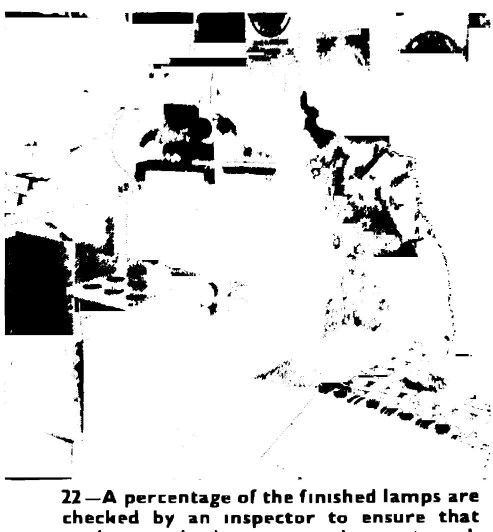


21 The finished lamps pass round this test table The operator on the left inspects and the one on the right packs the lamps.



22—A percentage of the finished lamps are checked by an inspector to ensure that quality standards are correctly maintained.

JOTTINGS

FLUORESCENT LIGHTING HAS been installed by Metropolitan-Vickers Electrical Co. Ltd, in the Chadderton Mill of S. Bourne & Co., Oldham. This mill has a weekly output of 55-66,000 lb. of fine count yarn. The decision to install fluorescent lighting throughout the mill was made only after the system had proved satisfactory during a trial period of several months. Lighting intensity is six times greater than previously, and this for an additional power consumption of 12 k.w. The absence of glare has decreased operator fatigue, and management report a uniform high rate of production over the whole working day.

THE WELL-KNOWN INSTRUMENT Companies, E. R. Watts & Son Ltd and Adam Hilger Ltd., are being formed into one Company registered as Hilger & Watts Ltd. Watts was founded in 1856 and has specialised in the manufacture of Surveying and Engineers' Measuring Instruments, while Hilgers, started in 1874, has built up a world reputation for Instruments for Research and Industry. The ranges of the respective productions are complementary to each other, and the Instruments developed by Hilger for Chemical, Biological and Medical Research will dovetail closely with the products of James Swift & Son Ltd., Microscope Makers, who are a subsidiary of Watts.

ATOMIC BOMB MANUFACTURE IS to be on a mass production basis, according to the United States Atomic Energy Commission. The design is to obtain a "continuous flow" of component parts.

INDUSTRIAL FIRST AID IN ITS advanced stage is instructively dealt with in a pocket book written by Dr. R. A. Trevethick, medical officer at the Steel, Peach and Tozer (Sheffield) branch of the United Steel Companies, Ltd., and now republished, price 3/-. It is obtainable direct from the printers, Henry Garnett & Co. Ltd., Rotherham, Yorks. Sir Reginald Watson-Jones, F.R.C.S., M.Ch., writes a foreword to the book.

If you know of a more efficient way of handling parts or material, building up an assembly, utilizing supplies, or laying out or organizing a department of a factory, write to the Editor about it.

THE INSTITUTION OF FACTORY Managers and the Institution of Works Managers propose to merge as from July 1, 1948. Councils of both organizations have agreed unanimously to the plan and will support its adaption at general meetings to be held forthwith.

MASS PRODUCED "PRE-FAB" farm buildings will be making their appearance on British farms in May. Steel salvaged from Anderson and Morrison air raid shelter will mainly be used in the production. There are two types of standard size buildings, one has a span of 32¼ feet and the other 17½ feet. Mr. Tom Williams, Minister of Agriculture, announcing this development, said production in two years should be sufficent to house 250,000 cows or their equivalent in other stock.

TOTAL ISSUED SHARE CAPITAL OF General Galvanizers, Ltd., Wolverhampton, and the Globe Tank and Foundry (Wolverhampton) Ltd., has been acquired by Bradley & Co., Ltd., of Albion Works, Bilston, Staffs., manufacturers of "Beldray" brand holloware.

SUCCESS OF THE "STAFF College" courses for foremen in the light engineering works of the Tube Investments Group in 1947 has resulted in a considerable extension for this year. The courses last two weeks full time in the company's time and, when possible, conclude with a week end at Ashridge College. The number attending each course is kept down to 15.

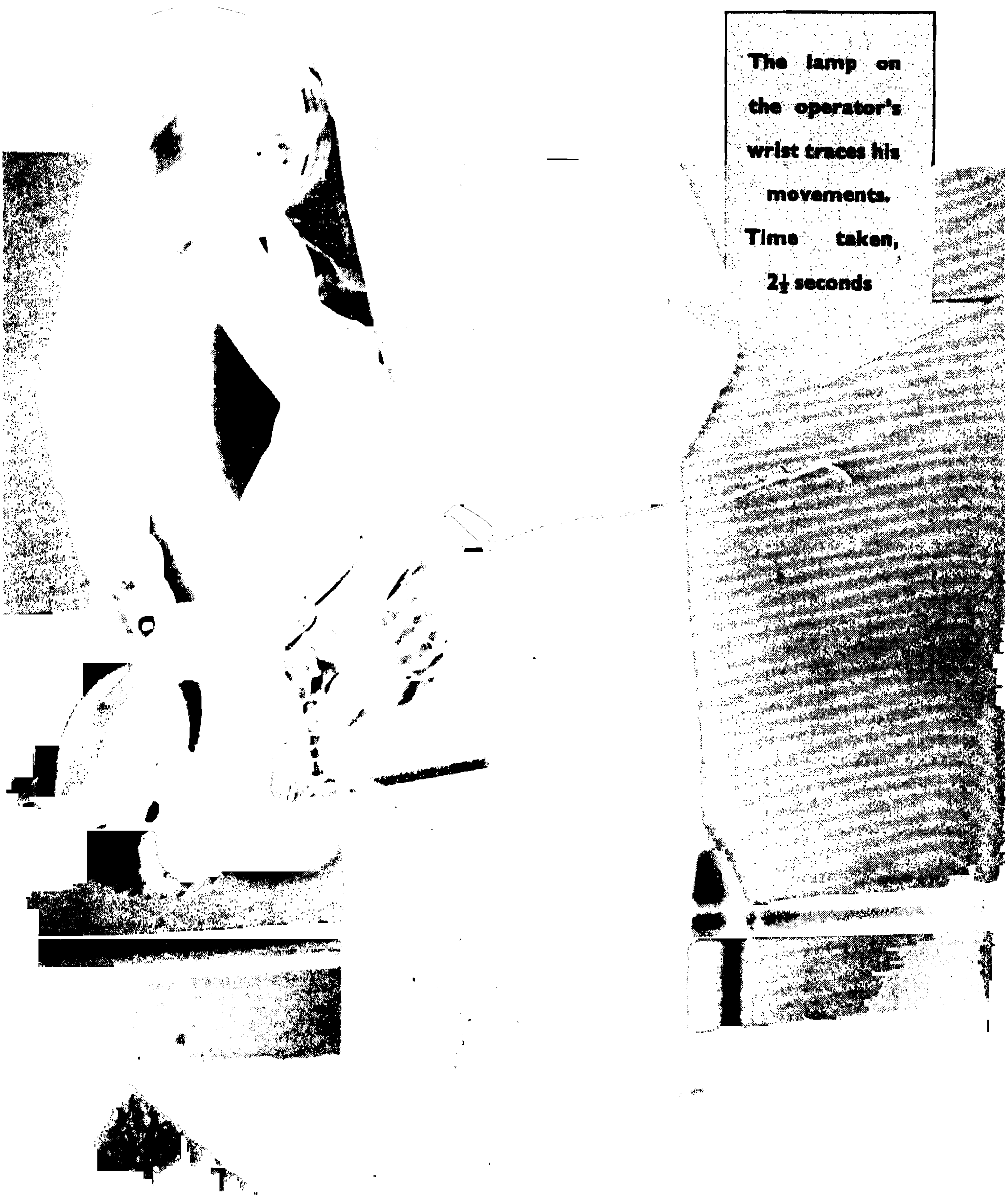
TUBE INVESTMENTS LIMITED, the Adelphi, London, announce that they have no knowledge of a Mr. Herbert Swinger who was stated in a report recently published in Britain and America to claim to be the representative of Tube Investments Limited and to have revealed a plan to sell to Mexico all-metal buses in a broken down form to get round the ban on the export of automobiles to that country. Mr. Herbert Swinger, Tube Investments say, is not associated directly or indirectly with any of the T.I. companies and his statement bears no relation to the policy of any company in the Group.

DETAILS OF THE TRAINING course for tea makers in industry are given in a small printed prospectus, issued by the Tea Bureau, Regent Street, London, which should be useful to welfare officers.

A SPECIAL ISSUE OF THE "Bulletin" of the House of Johnson, Mathey & Co. Ltd., price threepence, will be of interest to anyone concerned with the industrial application of the precious metals. Gold, silver, and platinum are dealt with under separate headings outlining their history, processing and use in industry.

PHOTO of the MONTH

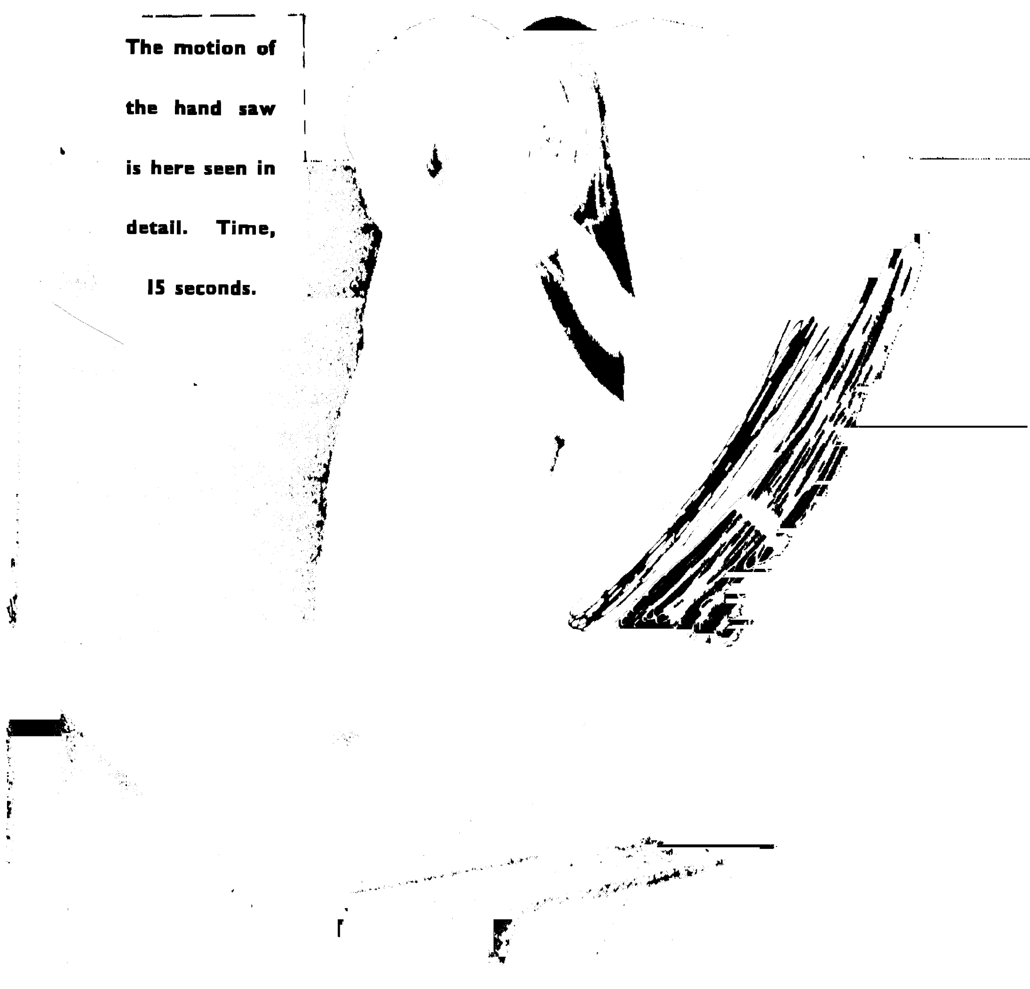
MORE WORK WITH LESS MOVEMENT

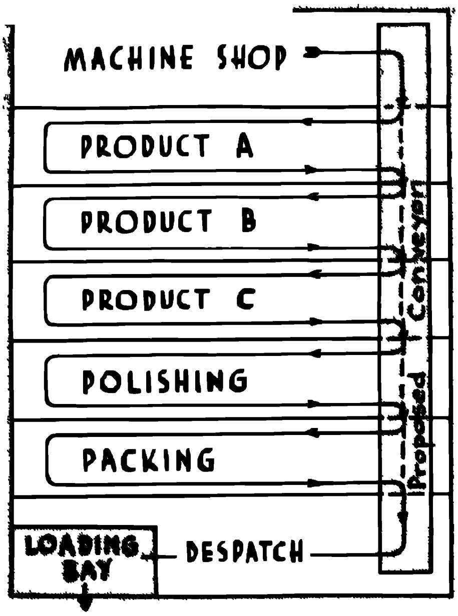


The lamp on the operator's wrist traces his movements. Time taken, 2½ seconds

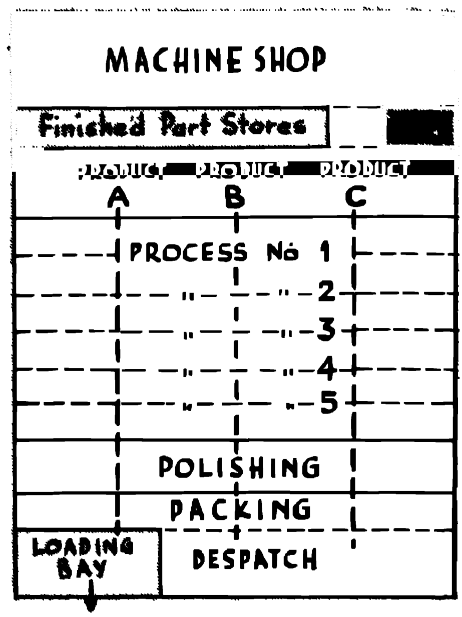
J. M. Benskine B.Sc. (Eng.) here examines the significance of present-day motion study tendencies. He will be prepared to advise readers on points arising from his article. The motion study photographs accompanying this article are by courtesy of Black & Decker Ltd., who developed a special technique for obtaining them.

The motion of the hand saw is here seen in detail. Time, 15 seconds.





The conveyor is not always necessary as may be seen from this diagramn, the firm proposed to install a conveyor at the side of the shop as shown.



By careful re-laying out, consequent on a motion study investigation, the same effect was achieved in a much simpler manner. The saving in cost was considerable.

MORE WORK WITH LESS MOVEMENT

The applied art now known as "Motion Study" and originally given conscious form by the pioneer work of Frank and Lillian Gilbreth, has long been utilised by technicians and administrators, ever since the dawn of organised production of wealth, military weapons and defence works, in ancient Egypt, Babylon, China and Mexico. Although only unconsciously incorporated in the training and outlook of men responsible for large scale enterprises, it has always been present in their mental approach, probably interwoven with flashes of "insight"—i.e. a sudden comprehension of what is really taking place, and the true significance of the various components of a complicated process or a critical situation.

To-day, Motion Study can be considered as a self-contained art employed by specialists responsible for the rationalisation of human labour, capable of being taught to technicians and administrators of all kinds, and employed by them in their everyday business as a tool which can help them to achieve their desired results. It can be used for the checking of results, so that an existing or proposed production process can be examined, revised, improved, and continuously modified in the desired directions, in the light of changing circumstances, be they of a technical, economic, political, natural, or social nature. Motion Study is the only body of knowledge which requires simultaneous consideration of *all* the individual aspects and components of a production process, *and* their mutual interrelation. It is thus the key to all productive arts and sciences, and the physical backbone around which the sister art: "Time Study" is built.

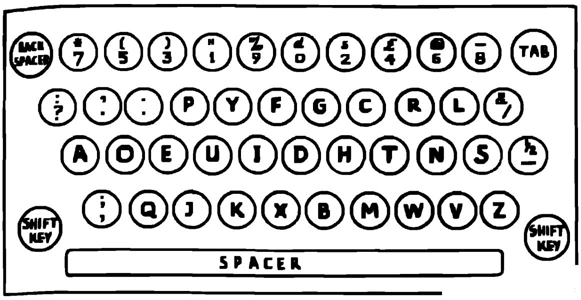
Component Sciences Incorporated in Motion Study.

To properly apply motion study it is necessary to make use of a knowledge and experience of relevant aspects of widely dissimilar sciences and arts such as engineering, biology, economics, physiology, psychology, and the chemical, electrical, biochemical, metallurgical or other details of the production process itself. In general, the following aspects of a production process have to be considered:

(1) The mechanics of physical labour, by man and beast.

(2) The physiology, psychology, and social impact of human efforts, both muscular and mental.

(3) The mechanics of the productive equipment, tools, machines, storage, etc.



This suggested new typewriter arrangement is based on motion study principles. It is claimed to be much faster than a conventional keyboard and much less fatiguing.

(4) The production process itself, as a technical problem.

(5) The economics of the process in terms of: money; time; materials; human effort; animal effort; mechanical power requirements; health; administrative and social pressure; and the actual consequences resulting from continuation or changes of existing methods, both to individuals and to groups of individuals who are concerned, or claim to be concerned.

(6) The possibilities and consequences of increased productivity: practical suggestions which can impact upon every aspect of industrial and social organisation, both within a tiny part of one department of a factory or enterprise, and throughout the entire world order.

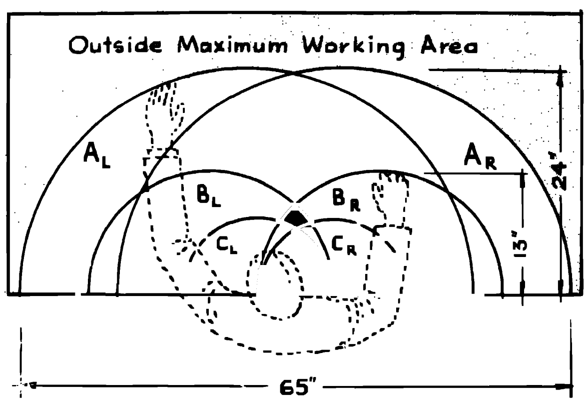
It goes without saying, that no one man can possibly fully appreciate all the changing combinations of the above matters, when considered in general. But even for narrow applications of motion study to specific problems and issues, it is extremely difficult for non-specialists to keep abreast of significant developments in time and motion study technique; similarly it is very difficult for experts who are engaged in rationalising one kind of trade or industry to realise the true significance of what is taking place in another industry—especially if there are widely dissimilar background histories and if the ratios of mental to muscular effort, as well as the absolute intensities of both, are completely different in the two cases. Yet, it is important for technicians and administrators to be kept informed of motion and time study developments, and it would be a valuable feature to encourage comparison of rationalisation tendencies in various fields. For this reason, the following subjects are worthy of consideration in this and future articles:—

(1) The basic elements of motion study technique: classical methods, modifications, accumulated experiences, available data, and new tendencies.

(2) The significant facts regarding relevant aspects of border-line subjects, which are not generally realised save by those who concentrate on allied fields of study and work.

(3) Demarkation between opinions, unverified facts and established facts. Conflicting opinions and techniques broken down into facts and contradictory tendencies, so that objectivity can be gained.

This diagram shows the respective ranges of the arm, wrist and forearm over a standard bench or table. Movements should always be kept within these areas.



(4) Review of tools, equipment and application of motion study and related techniques.
(5) Transfer of experiences from the rationalisation of one industry, trade, enterprise, craft, profession or process, to another.
(6) Problems of tuition and training of motion study experts, and of spreading a more general training for technicians and administrators at all levels, and in all branches of the production of real wealth.
(7) Survey of opinions regarding controversial issues and current problems.
(8) Establishing closer mutual relations with sister sciences and arts.

Motion Study is both a Method of Attacking Problems, and a Definite Body of Knowledge.

As a method of approach, motion study is simply a systematic method of examining a given production problem, with the aim of ascertaining if it meets the desired ends, and of recognising, isolating, and improving weaknesses and sources of trouble and inefficiency.

It has a similar application in the preplanning stage of individual operations, and initiation or control of complete undertakings. In many cases there are a large number of rival solutions to a complicated problem, both regarding the physical layout of equipment, the organisation of paper work, and the administrative set-up; checking the proposed solution by means of a motion-study type of analysis may help to show up possible errors and sources of weakness, thus avoiding the need to carry out expensive modifications at a later stage, or trying to overcome or ignore objectionable features which are inherent in the proposed solution, but which may be avoided if considered at the initial stages.

At the other end of the production scale, motion study has developed a number of well-known motion economy principles applicable to the individual operator and his productive environment. By breaking down the production process into elements and considering them all in turn, improvements can be made. Similarly, by breaking down the motions of an operator performing a necessary task into units, it is possible to establish the following results:

(1) Simplification of the operator's methods of work, leading to greater productivity and lessened fatigue.
(2) Corresponding improvements to the tools, equipment, and work station.
(3) Establishment of data applicable to other tasks.
(4) Provision of the correct basis for the complete mechanisation of certain productive tasks.

Actually there are two complimentary methods of studying motion economy at the individual point of production:

(1) The analytical methods of the Gilbreths and their school.
(2) The "Industrial Psychology" approach, which is to-day a complex of objective psychology, physiology, and sociological considerations.

It is the view of the writer, that the best approach is to work and think in terms of the kind of units of motion which the Gilbreths developed, and to use these "Therbligs" (Gilbreth spelled backwards) in discussing all aspects of motion economy and related sciences, much as the chemical conceptions of "atoms" and "ions" are employed in non-chemical border-subjects, and mechanics is responsible for terms like "pressure" and "force" being applied to fields once considered as being right outside that of the mechanical sciences, such as biology, and group psychology, education, training, publicity, and salesmanship.

The significance of recent developments of this technique by J. J. Gillespie, De Holzer and others may be outlined in future articles.

The Eighteen Classic Therbligs.

Frank Gilbreth listed seventeen "Therbligs" to which an eighteenth was added by other workers in this field. These classic units are given in Table I and correspond to the elementary components of human muscular work; they are also applicable to animal labour and husbandry if consideration of the differences in intelligence, and of psychology, is allowed for. Similarly, "Therbligs" are of great advantage in examining the functioning of machines operated by human beings, as well as in the development of automatic machinery, since all the Therbligs with the exception of "Plan" can be mechanised; and to a limited extent the planning function can be replaced by mechanisms which are able to select predetermined answers and solutions to a laid-down list of problems.

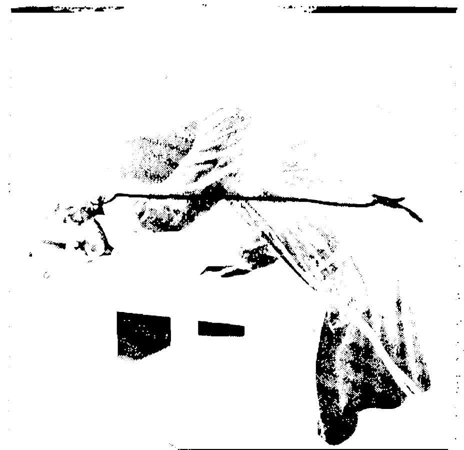
When a process is being broken-down into its elements it may not be necessary to use elements so fine as the Therblig units, for specific rate-setting tasks, or for solution of other problems.

Thus Table II shows typical job breakdowns which are coarser than the therbligs analysis, yet are quite satisfactory for the intended purposes. On the other hand, in many instances therbligs are too large, and it is necessary to employ sub-divisions of a therblig. Pushed to its logical extreme this

Please turn to page 74.

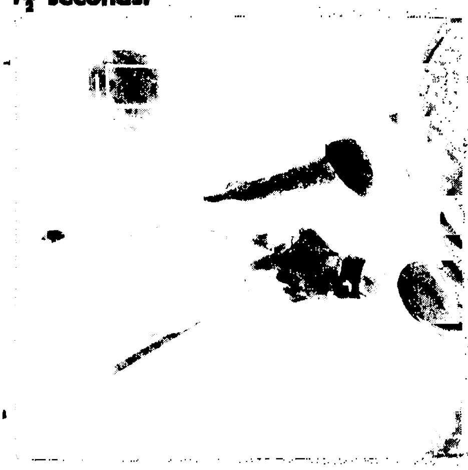
Motion tracer of an electric drill in use. Time : 52 seconds.

Motion tracer of a hand drill on the same job. Time : 175 seconds.

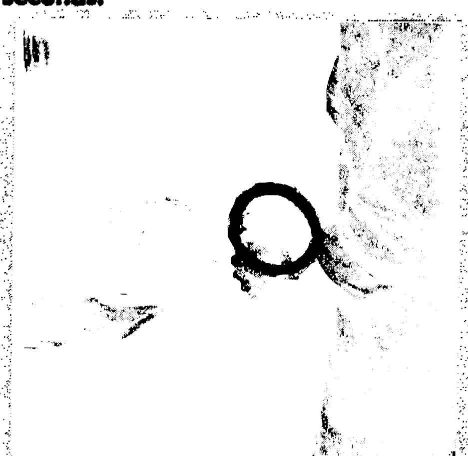


Cutting metal with an electric power cutter. Straight line motion. Time: $7\frac{1}{2}$ seconds.

The same job with hand shears, note the hand motion. Time : 35 seconds.



Wrist is quite motionless in drilling by this method. Time : 27 seconds.



The characteristic motion of turning the handle by hand. Time : 2 min 11 seconds.

MISCELLANY

ELECTRONICS EXHIBITION

AT a private exhibition held recently in London Messrs. Cinema Television Ltd., presented their latest developments of " Cintel " electronic timers, counters, recorders, chronometers, metal detectors, and oscilloscopes.

Of particular interest to the industrialist, as aids to production, are the standard counter, the process timer, and the metal detector. The counter provides for batching, selective counting, etc. to a maximum counting speed of 30,000 per second. Typical applications are counting cigarettes or screws. The process timer gives simple and accurate control for every kind of scientific and industrial process, and has a timing range from 0.25 to 90 seconds.

The metal detectors are sensitive to the presence of ferrous and non-ferrous metallic particles in non-metallic substances, such as foodstuffs, textiles, pharmaceutical products, pulp plastics, and rubber. Their application ensures adequate protection for expensive and often, under present conditions, irreplaceable machinery, saves production time, and checks quality.

With one type of equipment the material under inspection passes through a search head mounted over any convenient conveyor belt. Metal in the material distorts a symmetrical electro-magnetic field, and this results in the application of a signal to the input of an electronic amplifier controlling a relay. The latter operates a warning lamp, and provides facilities for switching off the conveyor motor, or actuating an automatic ejection or marking device, etc., as required. In a demonstration given a small pin-head of material was sufficient to stop the conveyor.

ARMATURE WINDING

THE rapid production of inexpensive electric motors for portable tools has caused demand to far outstrip the supply.

The small wound armature now produced by the million is designed, made and connected in every main theoretical detail the same as all armatures ever have been since the discovery that the direct current generators could be used for driving as well as generating. Fundamentally, the laws of Faraday, proved correct by Scott Maxwell, are as changeless as the laws of nature.

Small electric motors for buffing jewellery and later for dental machines were the first to appear. In comparison they were crude, clumsy and expensive, even when labour was one quarter its present day cost. They were designed and built only for direct current and were heavy but reliable.

What a contrast in the enormously wide range of uses and the rapidity of manufacturing processes with present day technique ! The winding of a complete armature by machinery, specially designed for quick production, can produce a neatly wound high quality armature in less than one tenth of the time of the finest skilled hand worker ever to be engaged on this work.

A machine for doing this work has been patented by people who have been engaged

The latest " Quickway " machine for winding armatures of small electric motors.

with manufacturing and repairing for over 40 years. The " Quickway " armature winding machine is designed in two models, one for repairing and the other for manufacturing, the only difference is in the geared driving unit to give the maximum value of production with a repetitively trained operator for mass output.

Demonstrations of this equipment at Leicester are most convincing. Some of the largest mass producers of small motors testify from considerable practical experience, far

more than the makers ever claimed for it. The latest machines for mass output are designed for one operator to control up to four armature winding machines at one time, automatically laying wires and filling slots to any predetermined number of turns.

ENGINEERS AND CUTS IN CAPITAL OUTLAY

CUTS in capital expenditure had some effect in the final quarter of last year on the notification by employers of vacancies to the Professional Engineers Appointments Bureau. In a number of cases, after the Bureau had nominated suitable persons for notified vacancies, the employer wrote that the appointment was being held in abeyance on account of the cuts or until conditions were more stable.

During 1947 the average number of engineers on the register was 634; in 1946 the average was 964. The total number of vacancies notified by employers in 1947 was 1048. An analysis indicates that less than 10 per cent. of engineers on the register are out of employment and most of these are over 45 years of age.

In the majority of these cases, factors which render it difficult to place the engineer in employment include the specification of a certain area, or a high minimum salary, or that the work required is in a very specialised field. In a few instances physical handicaps are responsible.

The number of offers made to engineers as the result of the Bureau's introductions greatly exceeded the number of actual acceptances; the housing situation must be recognised as the most serious obstacle in the filling of vacancies. This factor presents itself not only in this country but overseas as well.

Since the Bureau commenced to operate it has filled some 50 posts overseas. Although a number of men on the register are anxious to emigrate to the Dominions, there is difficulty in finding candidates to put forward for posts in the tropics, which represent a high proportion of the overseas vacancies notified.

Necessary forms may be obtained from the Bureau Registrar, 13, Victoria Street, London, S.W.1.

A LETTER FROM OUR POST-BAG

To the Editor of "Mass Production."

SIR,—As a maker of labour-saving equipment for a number of industries, I am convinced there is still a great deal of fear among wage-earners as to the ultimate consequences of increasing output because of their experience of the years before the war when the output of every industry was restricted. A case in point to-day concerns the refining of sugar, where the speed centrifugals has been increased by 50 per cent. and the output per man and machine has been doubled. Both a social and an economic problem are created by this typical technical result because, unless twice the amount of sugar is centrifuged, half of the operators of the centrifugals will lose their jobs.

Labour-saving devices mean either less labour for the same output or more output for the same amount of labour, provided the increased output can be bought. Unless it is made clear now that the additional purchasing power will be provided in the future when required, labour is unlikely to be enthusiastic about increased output. This is quite understandable when the financial authorities and leaders of industry give no assurance whatever that the ability to consume, once supply has caught up with demand, will be balanced with the " expanding " ability to produce, due to technical improvements. If this is not done potential supply will become greater than actual demand, and in consequence the selling price will fall, regardless of the cost unless artificially pegged. The former condition makes it impossible for private enterprise to survive, and both are major incentives for nationalization.

The sooner a policy of expansion is made clear to every wage-earner, the sooner will there be confidence in a material increase in output.

Yours faithfully,

ANTONY VICKERS

Hydraulic Coupling Patents Limited, Fluidrive Works, Worton Road, Isleworth, Middlesex. March, 1948.

INTERESTING ENTERPRISES No. 20

In 1840 Thomas Wall founded the firm now known throughout the country as T. WALL & SONS Ltd., and whose ice cream tricycles were a common sight in pre-war days. The story of the growth of that firm is the theme of this article.

SAUSAGES AND ICE CREAM

INVARIABLY, when that mythical being we refer to as "the average man" wishes to select any particular object as being symbolical of mass production, his choice falls on the humble sausage! We cannot say why, any more than we can say why the music hall comedian has made it the butt of so many of his jokes. The fact still remains that it is recognised as the symbol of mass production and the expression "they are turned out like a string of sausages" is a very familiar phrase.

With this in mind, therefore, we were quite interested to receive an invitation to visit a really large sausage factory. When, to the manufacture of the sausages was added the production of pork pies, wafer biscuits and ice-cream, our curiosity was intense and we accepted with alacrity. Consequently we found ourselves, one cold day in February, at the Acton headquarters of T. Wall & Sons Ltd., originators of the famous slogan "Stop Me and Buy One." Incidentally we learned how that well-known slogan originated, but of that more anon.

Sausages and ice-cream would appear at first sight to have little in common. To the average Londoner it is probably common knowledge that "Wall's the ice-cream people" were originally sausage and meat pie makers, and, in fact, still do a tremendous business in those commodities. To the provincial reader, however, it will probably come as a surprise. We had the privilege, on the occasion of our visit, of hearing at first hand the story of the firm's growth and history.

The sausage and pie part of the business had a start of some 130 years over the ice-cream element. We learned that in 1786 one, Edmund Cotterill, manufactured sausages in St. James's market in London. Later, in 1790, a certain Richard Wall either bought or inherited Cotterill's business and ran it himself. In 1834 he moved to 113 Jermyn Street—premises which, incidentally, are still occupied by the firm to handle their West End trade.

Richard Wall now disappears from the chronological table, for in 1836 the firm became Anne Wall and Son. In 1840 Thomas Wall took over, and in 1905 the business was formed into a private limited company under its present name.

That the products of the firm achieved a considerable reputation even in the early days, is shown by the fact that the Walls were granted Royal Appointments by Their Majesties King George IV., King William IV., Queen Victoria, King Edward VII. and King George V. and Queen Alexandra.

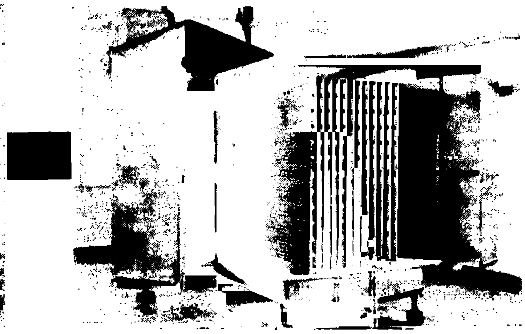
That of William IV., granted in 1830, is addressed to Thomas Marrable Esq., Secretary to the Board of Green Cloth and reads as follows:—

> "These are to Will and require You forthwith to Swear and Admit the bearer hereof—RICHARD WALL—into the Place of Pork in ordinary to His Majesty. He is to have and enjoy all the Rights, Privileges and advantages to the said Place belonging during my will and pleasure and for so doing this shall be Your Warrant."

We learned that one of the men who made sausages for Queen Victoria has only recently retired. He is Mr. W. Kuell (65) and he started work at the original Jermyn Street shop in 1898. His wages were eight shillings a week, plus board and lodging over the shop. He later moved to the Acton factory.

The business became associated with the Unilever Group in 1920 when MacFisheries Ltd., on account of the large quantities of

Part of the battery of stainless steel pasteurising vessels.



This gigantic cooler is believed to be the largest in the country.

sausages required for their shops, obtained an interest in the firm. In 1938, however, the firm became more directly associated with Lever Bros. and Unilever Ltd., whose Chairman, Sir F. D'Arcy Cooper, became also Chairman of Walls. Shortly before the amalgamation, the conduct of the business was in the hands of three eminently practical men, Mr. Lionel G. Rodd, formerly Manager to Mr. Thomas Wall; Mr. Charles Rodd, his brother, and Mr. A. H. G. Short who had previously been associated with Mr. Charles Rodd in a similar business at Poole, in Dorset.

Mr. Short subsequently became a Director of Lever Brothers and Unilever Ltd., from which position he has quite recently retired.

The Company operates three factories in London and one at Godley, in Cheshire. It will shortly be operating a fifth at Craigmillar, near Edinburgh. Apart from these, there are Ice-Cream Divisional Headquarters at Acton, Croydon, Birmingham, Southampton, Godley and Edinburgh, all of which are equipped with extensive cold storage accommodation. They also control, in normal times, some 150 Ice-Cream Depots handling local requirements all over the Country.

The present headquarters of the Company is the factory at The Friary, Acton, London, W.3. This factory was built in 1920/21, and was originally laid out as a meat products factory. A small portion of the West Wing was set aside for the inauguration of the ice-cream project, and as time went on, the whole of this wing became the ice-cream factory and the meat products were moved to the East Wing, where various extensions were carried out to house them. The centre blocks of the factory, between the two wings, house the Meat Products Despatch Dept., and the Engine Room, Boiler House, etc.

It is characteristic of the virile policy of the firm that practically every year saw fresh buildings going up and fresh plant and machinery being installed. A large garage was built shortly after the main building was finished, and a few years later another large garage, adjoining this, was purchased to house the ever-growing ice-cream transport requirements.

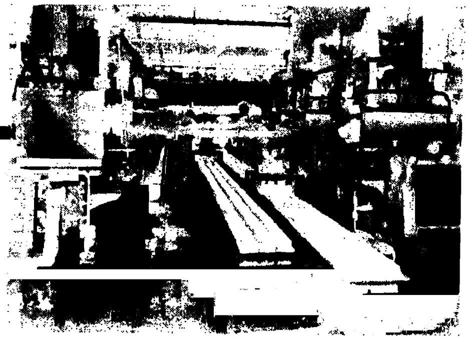
Cold stores were built for frozen meat, large compressors were installed to take care of the rapidly increasing refrigerating load, and a small plant for manufacturing solid carbon dioxide was built to be followed later by another of larger dimensions.

Interesting as this historical fact-gathering is, there is unfortunately, a limit to the amount of time which can be allowed for it on a visit of this nature and as we had to cram a lot of investigation into a very short time if we were to do justice to the factory, we set off in company with one of the firm's technicians (he insists on remaining anonymous) to study the ice-cream section of the factory.

Ascending in the lift to the top floor we found ourselves in the mixing and pasteurising room. The first impression is one of spaciousness and cleanliness; white-tiled walls, white ceilings, plenty of windows and clean-looking yellow tiles underfoot; in fact, everything one would expect to find in a modern dairy which, of course, the factory virtually is.

There are three pre-mix tanks in which the present day ingredients of the ice-cream are mixed. Flour and water are mixed in one, liquid sugar and milk powder in another, and in the third margarine, after being fed through a butter or margarine Shiver, is melted to a liquid form. The ingredients are then pumped into eight stainless steel pasteurisers and there maintained for half an hour at a temperature of 150 Fahrenheit. From the

Storage tanks in which the "mix" is retained until required by the freezers.



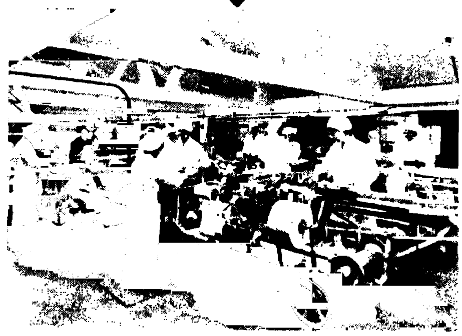
Here we see the ice cream coming along from the extruders.

pasteurisers the liquid, now known as the "mix," passes through a filter into three Viscolisers which ensure a homogeneous mix, since the liquid is under pressure of approximately 2,000 lbs. per square inch. The next stage is to a cooler, believed to be the largest in England, which has a capacity of 2,000 gallons per hour and reduces the temperature from 150° to 38°.

The mix flows down the sides of twelve enormous stainless steel plates, the upper portions of which are water-cooled and the lower parts ammonia-cooled. From there it is passed down by gravity to the storey below, into large storage tanks. These tanks are glass-enamel lined to ensure cleanliness, and are completely cleaned out after every operation. There are four tanks of nearly 5,000 gallons capacity, one of 3,000 and three of about 900. The temperature of the liquid at this stage is kept below 45°.

On this floor also is a calorifier for heating the water, which is sprayed on the sides of the pasteurisers to heat the mix. These sprays, our guide informed us, are used to avoid any burning on the inside of the pasteurisers which might result from the application of direct heat.

The storage tanks are emptied approximately every twenty-four hours, the mixture flowing by gravity into batteries of continuous freezing machines. The mix leaves the freezers in a semi-solid form at a temperature of 25° Fahrenheit. While in the freezer air is introduced into the mix to impart the proper texture so that a hundred gallons of the liquid will make approximately a hundred and eighty gallons of ice-cream; the air content of the mixture is checked every fifteen minutes. When it leaves the freezers it is extruded in continuous ribbons on to trays covered with waxed paper on conveyor belts, divided



This is a view of the battery of automatic sizing and wrapping machines for ice cream bricks.

The machines seen in this photograph are filling tubs direct from hoppers.

up into strips 3 feet long or smaller blocks, loaded on to special crate-like trolleys and fed into a cold blast hardening tunnel.

We watched the crates of cut blocks disappearing into the trap in the wall which led to this quick freezing chamber and, intrigued as to what happened to them inside, we followed out guide into the chamber. The inside of this room would, we feel sure, serve as a first class training ground for prospective Arctic explorers, it has everything; cold, darkness, frost and a howling gale of icy wind to round off the illusion.

Sixteen fans circulate the air through five miles of ammonia-filled piping and blow it down over the tracks along which the crates of blocks are travelling. The blocks of ice-cream take just under an hour to pass through the tunnel and the average temperature during their passage is minus 20° Fahrenheit. Small wonder then that on emerging from the tunnel into the comparative warmth of the extruding and packing room we felt as though we had entered a boiler house by mistake. Even under these Arctic conditions a certain amount of manual supervision is necessary in this chamber but men who work there do only half-hour shifts and wear special protective clothing.

There are different types of freezers, which, instead of extruding a continuous strip, either fill the tubs direct or fill one-gallon cans. The capacity of the individual strip extruders is about 240 gallons an hour, whilst the tubs are filled at a rate of about forty-five per minute. From the hardening tunnel or cold chamber the blocks or ribbons go by conveyor belts to wrapping machines.

Fifteen machines wrap brickettes at a speed of sixty-five per minute each. The brickettes are then stacked by hand six at a time, and wrapped by a second machine into packets of six. Similar wrapping machines handle the larger blocks at a speed of some forty-two per minute.

The wrapped brickettes, larger blocks and tubs are then put in tins and stored, as also are the gallon tins, in a cold-storage room where the temperature is maintained at minus 15° Fahrenheit, to await despatch.

As we watched the crates of packed ice-cream passing into the cold store we thought we had seen all there was to see in the ice cream section. Our guide, however, quickly proved us wrong by leading the way toward a section of the floor which was obviously a separate department. As we looked we realised that this was the place where they made the " choc-bar," that popular chocolate-coated brick in the silver foil wrapper.

Although the section was not actually working, owing to lack of supplies, our guide showed us the system of operation. Cut portions of ice-cream are passed along a wire belt inside a chocolate enrober and sprayed from the top with liquid chocolate. We asked the question that every visitor asks ; how do the bottoms of the bars get coated ? The answer was evident when our guide lifted the cover off the machine and showed us the " works." The open meshes of the wire belt carry the bar through a puddle of liquid chocolate in a well in the base of the belt track from which it picks up enough chocolate to cover the bottom.

Two more surprises were in store for us

These wrapping machines are kept specially for the wrapping of "choc-bars."

This is a pre-war photograph of the packing lines for other ice cream products.

before we left the ice-cream section ; the wafer baking plant and the gateaux room. The wafer plant comprises batter mixing equipment, four continuous wafer ovens by Vicars, and cutting and wrapping machines.

The liquid batter mixture for wafer biscuits is poured on to a plate resembling the bottom half of an open book. The top half of the "book"—another plate—comes down on top and the clamped plates revolve in a gas oven, heated both below and above, for two minutes, after which the wafers are cooked and ready for cutting which is done by rotary saws on a specially designed frame.

As we left the wafer baking section we called in at the gateaux room to have a look at these hand-made speciality items. The forewoman in charge opened one up specially for our benefit and we were surprised at the beauty of the decorative workmanship on the sides and top of the specimen we saw.

To our great surprise, as we emerged from the factory into the yard we found that we had spent the entire morning in our study of the ice-cream plant and it was obvious that, if we were to see anything of the meat products section we should have to stay far longer than we had at first anticipated. As we passed through the yard we watched one of the giant road vehicles entering to pick up its load and asked our guide for some facts and figures regarding the transport side of the business. This is what he told us :

" The problem of heat insulation is one that always confronts us, as will be appreciated when it is remembered that ice-cream has to be held at a temperature below zero Fahrenheit during storage and transport. Much thought and ingenuity have been expended, not only in the insulation of vans and tricycles, but also in the designs of insulated containers for the rail traffic of ice-cream, and for the transfer of solid carbon dioxide from the factory to ice-cream distribution depots. The refrigerator cars you see here can carry a total of 511 tins of brickettes or blocks, each tin containing 96 brickettes or 18 blocks or 60 tubs.

" Transport by road, rail and sea is a very important section of our distribution system. In 1939 we had some 8,000 tricycles bearing the familiar slogan " Stop Me and Buy One " on the road,now we only have five operating in an experimental way in Barnstaple, Devon. Practically all the ice cream we can make is sold through shops and catering establishments. Supplies are severely restricted and of course nowhere near satisfies the demand.

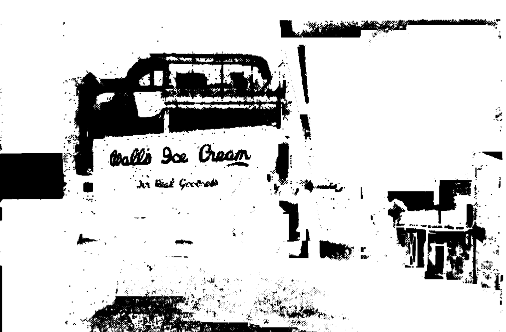
We asked our informant, as we walked across the front of the office building on the way to the meat products section, how the famous Wall's tricycles came to be used and thus learned of the origin of the firm's famous slogan.

Just over 25 years ago Mr. Cecil W. Rodd, then a junior employee, went to the United States to study ice-cream production. At that time ice-cream as we know it to-day had never been seen in this country. He returned to London—only to find that British shops did not consider ice-cream a saleable proposition.

Convinced that the shops were wrong, Mr. Rodd, who is now Chairman, considered the possibilities of using tricycles to sell it. He put the idea to his company and suggested using the slogan, " Stop Me and Buy One." They put 10 tricycles on the road with results that all the world now knows. By 1939 there were 8,500 Wall's tricycles patrolling every road in Britain.

By this time we had reached the other side of the building and our guide handed us over to his opposite number who was to conduct us in our wanderings around the meat section.

A view of the laboratory, daily checks are made on all of the Company's products.



The despatch bay. The insulated road van may be seen loading up from the conveyor.

We started in the hanging room and were surprised at the quantity and quality of the meat we saw awaiting the attention of the "boners."

Meat, normally beef, mutton, veal and pork, is received in the hanging room and transferred to the storage chambers for use as and when required. Boneless meat then passes straight to the cutting and grinding section. It is cut by electric band-saws into chunks about six inches square, and then goes to the grinders, which are simply enormous mincers fitted with either three-quarter inch plates or half-inch plates. The majority of the meat, of course, is not boneless and to bone it, about forty-five expert boners are employed. They can dispose of as many as 300 carcases in 4½ hours. Incidentally, the sight of about fifty men each armed with a knife and spaced about three feet apart along an enormous bench all busy cutting and carving at huge pieces of meat is a sight that must be seen to be believed, especially in these days of microscopic rations.

Our guide drew our attention to two unusual machines for de-rinding pork. These ingenious pieces of mechanism, can take a large section of pork and, with uncanny accuracy, peel from it a thin layer of rind leaving behind the clean white fat of the pork. The machines, as though to add the final touch to the illusion of magic are actually capable of sharpening their own knives when necessary!

We passed on into the mixing room to see what happened to the embryo sausages after they left the boners and the de-rinder. On the way we asked our guide what the supplies of meat were like and what sort of reliance could be placed on the supplies from the Ministry of Food. He informed us that the pork allocation from the Ministry kept fairly constant but this only represents about five per cent. of the total.

The mixed meats then go to mixing bowls, where they are mixed for about four minutes with rusk cereal, seasoning and a little water. The mixture is then taken to a battery of filler-machines, each of which holds about 120 lbs. of sausage meat and feeds meat out under pressure, generated by an oil-operated piston, through nozzles graduated in size according to the type of sausage required. It is at this stage that the meat is introduced into the skins.

The skins, which are originally lengths of animal intestines, are in the first place delivered to the factory in bundles of hundred yard lengths. After overnight soaking these skins are washed and rubbed on boards to make them soft and are then wrapped mechanically round hollow steel spindles.

These spindles fit the various size nozzles of the filler-machines and the skins are transferred from the hollow spindle over the protruding nozzles of these machines. As the meat begins to extrude from the nozzle, an operator pulls the end of the skin over the end of the nozzle and controls with her fingers the rate at which the meat draws the skin from the nozzle.

The lengths of covered sausage, which is in a continuous strip, are deftly broken up by twisting into the appropriate size or weight by other operators. Watching the girls twisting the string of sausages into "knots" our guide could evidently sense our reactions and invited us to "have a go." With the sincere belief that, if we had tried we should have let the girls have a good laugh at our expense, we politely murmured "no thanks" and passed on along the line.

At an average table where a filler is in operation some 500 lbs. of sausages can be disposed of in an hour. The sausages are then conveyed, either automatically or by hand to a cooling room where they stay for about thirty minutes at a temperature of 30 to 40 Fahrenheit to dry out the superfluous moisture.

Leaving the sausages to harden in the cooling room, we entered the meat pie department. There is a high degree of mechanisation in the bakehouse where the coverings for the meat pies are made. From an upstairs loft, flour is fed down into 2 ft. 6 in. mixing bowls, where agitators combine it with fat, water, and baking powder. Mixing takes approximately half-an-hour. The resulting dough is then treated according to its destination: if it is to be made into tops of pies, it is fed into large automatic rolling machines, the modern equivalent of the domestic rolling pin, which can be adjusted to produce sheets of any desired thickness. The sheets are then stamped out into the appropriate shapes by hand.

If the dough is to form the base and side of the pies, it is in the first instance dropped in blocks into a hopper which feeds out rectangular pieces, varying in size according to requirements, of from one to three-and-a-half ounces. These pieces are placed in the bottom of varying shaped pie-tins which revolve in turn under an electrically-heated die-stamp which moulds them to the shape of the tin and then under a tap from which the appropriate amount of filling is ejected.

Some thirty pies a minute from each can be shaped and filled in this way, the tops being

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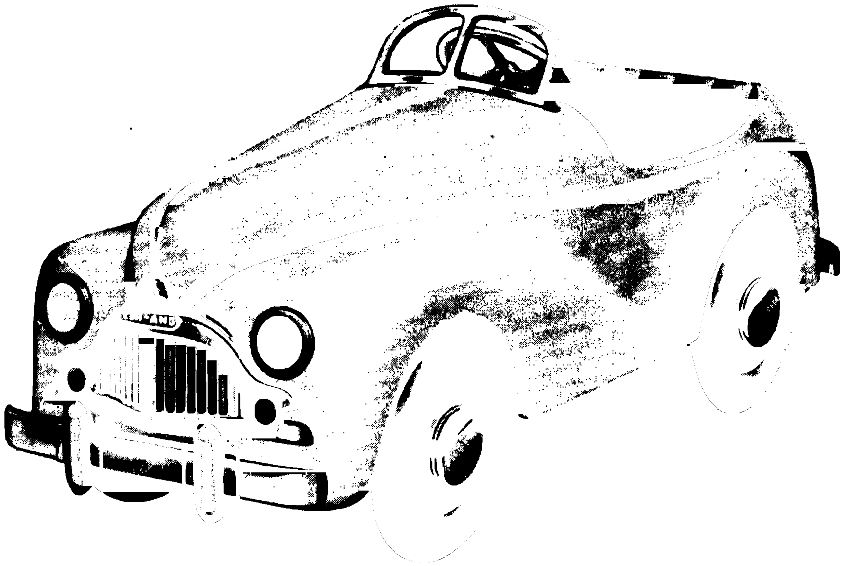
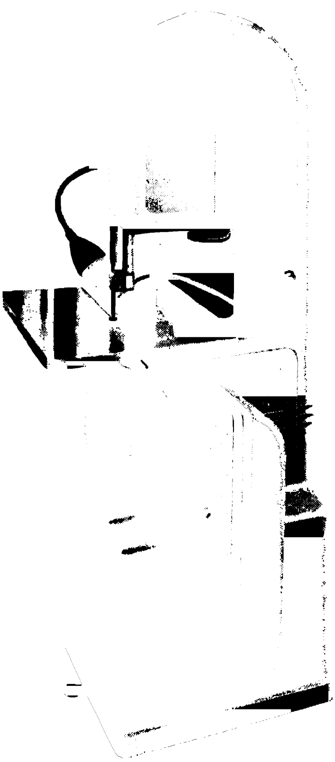


INDUSTRIAL DESIGN AND PRODUCT STYLING AESTHETICS



The "Wurlitzer" trend has now reached the children's toy motor field, this example by Triang Toys is in the best tradition, it has a cream body with red lining and trimming and chromium plated fittings. A very good representation of the modern American type car.

The band sawing machine on the right is another example of modern clean styling applied to industrial plant.

AMERICAN DIGEST

Bringing news of the latest developments from the U.S.A.

Induction Heating Gun. The "Tocco" induction heating gun is an 8 lb. unit which may be held in the hand like a portable electric drill and is faster than a soldering iron or oxy-acetylene torch for soft soldering brazing annealing, hardening etc.

In use, the nose of the gun is placed against the work to be heated and the trigger is pulled.

Ferrous or non-ferrous metals may be heated and power is obtained from a 10,000 c/s A.C. generator.

Flux for Silver Brazing. The United States Navy Department Bureau of Aeronautics has developed a flux with which consistently strong silver brazes can be produced.

It consists of 50% potassium tetraborate 30% potassium acid fluoride 15% potassium fluoborate and 5% boric acid.

This flux is believed to satisfy all specifications for a silver brazing flux for alloys flowing at temperatures up to 1300° F.

Infra-red Soldering. It is not generally realised that infra-red heating can be used for soldering operations and a very interesting example is reported from the U.S.A. where a manufacturer uses this method to solder adaptors to brass refrigerator valves.

Thirty six lamps consuming a total of 12 kilowatts are used and are mounted as closely as possible to a conveyor carrying three valves. On emerging from the heating tunnel the valves are at a temperature of 500° F. and are ready for the application of flux and solder.

Before the installation of infra-red heating the production rate was 180/hour from 4 operators but it has now been raised to 200/hour from 3 operators and with fewer rejects.

Thermoplastic Compounder. The "Plastimaker" equipment for compounding thermoplastic materials requiring a liquid plasticizer is said to incorporate a new processs developed by the Hungerford Plastics Corp.

The required resin, dye, stabilizer, filler, etc., is placed in a rotatable chamber and during rotation the liquid additives are sprayed in. Then, without stopping, hot, dry air is blown in until the contents are dehydrated.

The material, which remains as a powder throughout the process, is then ready for loading into moulding or extruding machines, without the usual mechnical working, hardening and grinding.

Automatic Polarity Reversal for Electroplating. Equipment to reverse the polarity and to control a predetermined time-cycle between positive and negative plating times is being made by the G. L. Nankervis Co.

It is called the Electro-Reversal Control Unit and a single moisture-proof cabinet contains all the timing controls relays etc. The manufacturer has tested these units mainly with cyanide copper plating and claims:

1. Nodules formed by "treeing" are easily levelled off.
2. Increased cathode current density is permissable.
3. There is improved thickness in recesses or low current-density areas
4. Pole-free deposits are easily obtainable, also brighter deposits.

Odour Classfication. A definite advance in the classification of odours has been made by the development of the Crocker-Henderson odour standards in the laboratories of Arthur Little Inc. in the U.S.A.

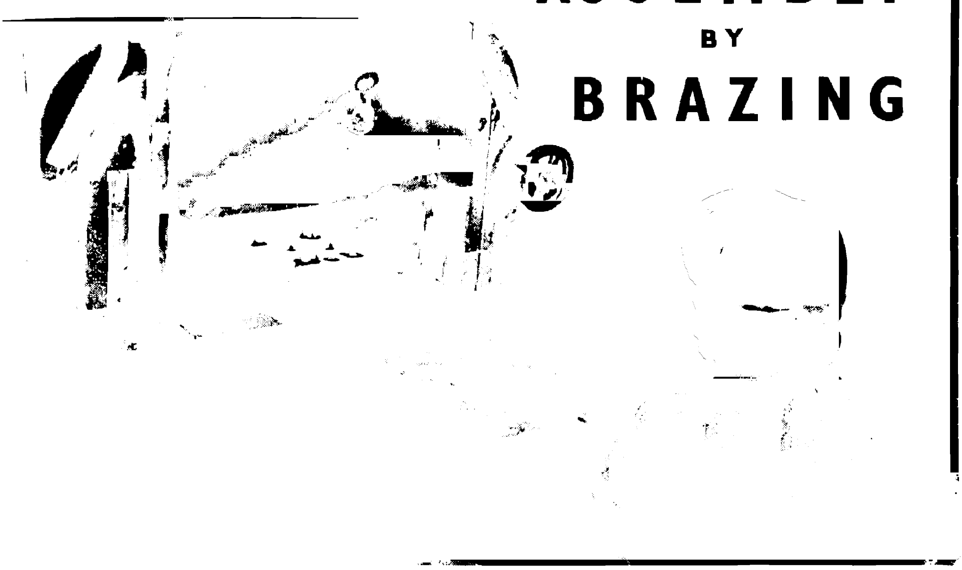
Odour values are judged by reference to a set of 32 unchangeable standards grouped under four headings termed acid fragrant burnt and acrylic. There are 8 intensities of each component and several thousand combinations are possible but all the data necessary for the specification of an odour is a single four-figure number. There are definite ranges for such odours as fishy rancid, foetid, tarry, flowery, etc. and only a few minutes are required to evaluate an odour and the results are not influenced appreciably by personal factors.

This system has many industrial uses including the odour analysis of raw materials and finished products.

The 32 standards, with extra empty phials, are supplied in a wooden block, with a transparent plastic cover.

Heatproof Paint. "Markal" heatproof paint has been developed to prevent hot metals from corroding and scaling at temperatures up to 1800°F. The hot metal can be subjected to sudden temperature changes such as quenching in cold water, without cracking or peeling of the paint.

The suggested uses for the paint are smoke-stacks, annealing boxes, exhaust manifolds, furnace pipes etc.



ASSEMBLY BY BRAZING

H. R. Brooker of Johnson Matthey & Co., Ltd., discusses the Low Temperature Brazing Process.

It is inevitable that the production engineer faced with an assembly problem will tend to select or recommend the methods with which he is most familiar or those which fit in most readily with the shop facilities available. Nevertheless, there are frequently cases where an entirely open mind will make a wiser selection of method than one which is canalised by previous experience or shop preferences.

Low temperature brazing with the use of silver brazing alloys is an assembly "tool" which, more and more, is claiming recognition as a speedy, economical and reliable assembly process.

Its outstanding advantages are the simplicity of the equipment required for the more ordinary versions of the process, the high strengths of the joints obtained and the comparatively low temperatures employed which limit the degree of distortion and structural change resulting in the finished work. In addition, proper application of one or other of the available variants of this family of processes can result in definite economies, particularly in the limitation of necessary finishing operations. When the assembly involves the joining of dis-similar metals, low temperature brazing is of outstanding interest in that most of the alternative methods of thermal assembly are at their lowest efficiency.

Silver brazing alloys.

In recent years there has been largely a departure from the use of the old established silver-copper-zinc alloys typified by grades A and B in B.S.S. 206. Their place has been taken by the newer quaternary alloys containing cadmium and, where copper or copper alloy components are involved, by the silver-copper-phosphorous brazing materials. The more important physical properties of these brazing alloys are shown in Table I.

These materials are available in the widest variety of forms which include the usual range of rod, wire and narrow strip sections suitable for hand application in torch brazing to all sizes of components. In addition, one can obtain foil in any width from 6 inches downwards at a minimum thickness of about 0.003 inch, wire down to about 0.005 inch diameter, wire rings or circlips of all sizes, washers pressed from sheet, special inserts of any type specified, powder ready mixed with flux, and, by special arrangement, base metal strip clad with the brazing material.

TABLE I.
PROPERTIES OF SILVER BRAZING ALLOYS.

	Melting Point		Tensile Strength tons/sq. in	Elongation per cent.	Brinell Hardness	Electrical conductivity, per cent. I.A.C.S.
	Liquidus	Solidus				
Ag Cu Zn Cd (Easy-flo) B.S.S. 206 grade C	630°C	620°C.	30	35	131	21
Ag Cu Zn Cd ("Argo-flo")	665°C	605°C	32	20	136	20
Ag P Cu ("Sil-fos")	705°C	625°C	45	10	187	7.7
Ag P Cu ("Silbralloy")	694°C	638°C	35	5	195	5.8
Ag Cu Zn B.S.S. 206 grade A	737°C	690°C	25	16	105	27
Ag Cu Zn B.S.S. 206 grade B	788°C	698°C	26	12	120	22

All figures relate to specimens in the cast condition

The provision of all these special forms is necessary for the ready and economical application of intrinsically costly materials to the mechanised versions of brazing processes which are steadily gaining ground in production engineering. It is only by the accurate control of the form, positioning and quantity of brazing material applied that the full economies which low temperture brazing introduces in suitable cases can be obtained.

To match the low temperatures and high speeds at which these silver brazing alloys penetrate capillary joints, a range of suitable fluxes has been developed. These are of the fluoride type and are characterised by their considerably greater activity as compared with the borax-base fluxes which were formerly used in most cases. The difficulty of ready removal of flux residues from completed work is to a large extent relieved by the increased water solubility of residues from fluxes of the newer types.

Brazing Methods.

Torch Heating.

In spite of the growing use of more novel methods of heating work to be brazed, by far the greatest volume of brazing is still carried out by torch heating. The comparatively low temperatures employed in silver alloy brazing permit the efficient use of such gas combinations as compressed air/coal-gas, oxygen/coal-gas, and oxy-hydrogen as well as the oxy-acetylene mixture which is standard for most gas welding operations. Compressed air and coal-gas can be used in many cases with resultant economies in gas costs and freedom from the inconvenience of constant exchange of compressed gas cylinders, while the lower maximum temperatures imposed by this gas mixture give an added insurance against accidental damage to the work due to overheating.

The essential equipment for torch brazing is of the most moderate character and represents very little capital expenditure, comprising only the torch, a suitable bench, heat insulation bricks for use as reflectors and screens together with whatever jigs are necessary for locating the parts to be joined and, finally, washing facilities for removal of residual flux. Such simplicity is illustrated by Figure 1 which shows a three-operator set-up capable of brazing steel banjo fittings to copper fuel pipes at about 300 an hour, the quality of the work being to A.I.D. requirements.

A further interesting torch brazing operation is shown in Figure 2 where joints are being made on refrigerator restrictor tubes. The tubes are connected by rubber adaptors to a coal gas manifold before heating commences, the gas issuing from the open end of the tube being ignited as a safety measure. By this

means, a reducing atmosphere is maintained inside the tubes during brazing and oxidation of the bore is prevented, thus eliminating possible blockage of the sytem by particles of loosened scale. The brazing alloy used is of the silver-phosphorous-copper type which can be used on these copper tubes without flux, thereby eliminating a further possible source of contamination of the interior of the refrigeration system.

Figure 3 shows the application of radiant heat gas burners in a multi-station set-up for the low temperature brazing of automobile damper sub-assemblies.

Furnace Heating.

In those cases where the engineer is faced with long runs of similar assemblies of modest size, efficient use can be made of muffle furnaces of the continuous or semi-continuous type, with or without provision for a protective atmosphere.

The economic employment of furnace heating for brazing depends to a large extent on the proper design of the joints so that the parts remain in their correct relative positions without need for jigs. In the majority of cases, the brazing material is applied as a wire circlip in furnace brazing, although considerable use is made of stamped washers, foil inserts and silver brazing alloy powder. Figure 4 shows some standard designs of joints for furnace and induction heating and Figure 5 indicates how the wide range of available forms of silver brazing alloys permits their ready application to such methods.

Although the use of a protective atmosphere in the muffle furnace is of value in eliminating oxidation of the work, it is rarely the case when using silver brazing alloys; that the use of flux can be entirely avoided. For this reason, it is often more economic to use simple furnaces open to atmosphere, the capital cost of which, as well as the running costs, are considerably less than those of the type of equipment necessary for the copper brazing of mild steel. An exception to the general rule of using flux in furnace brazing is when copper assemblies are furnace brazed in an open furnace, without flux, employing a brazing material of the silver-phosphorous-copper type.

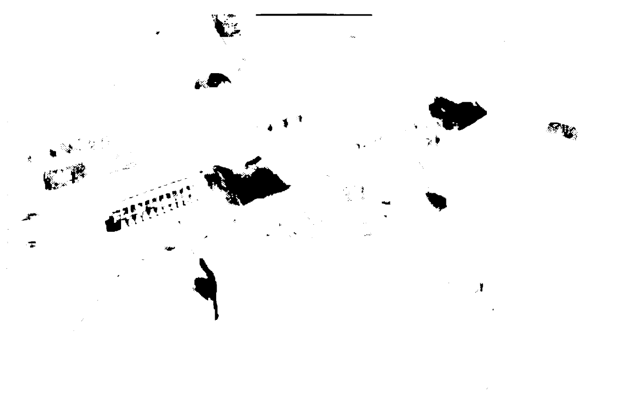


Figure 1—High speed torch brazing aided by simple but effective jigs. Courtesy — Aero Pipe and Glass Co. Ltd.

Figure 2—Passing coal gas through the tubes while brazing ensures interior cleanliness. Courtesy— Frigidaire Ltd.

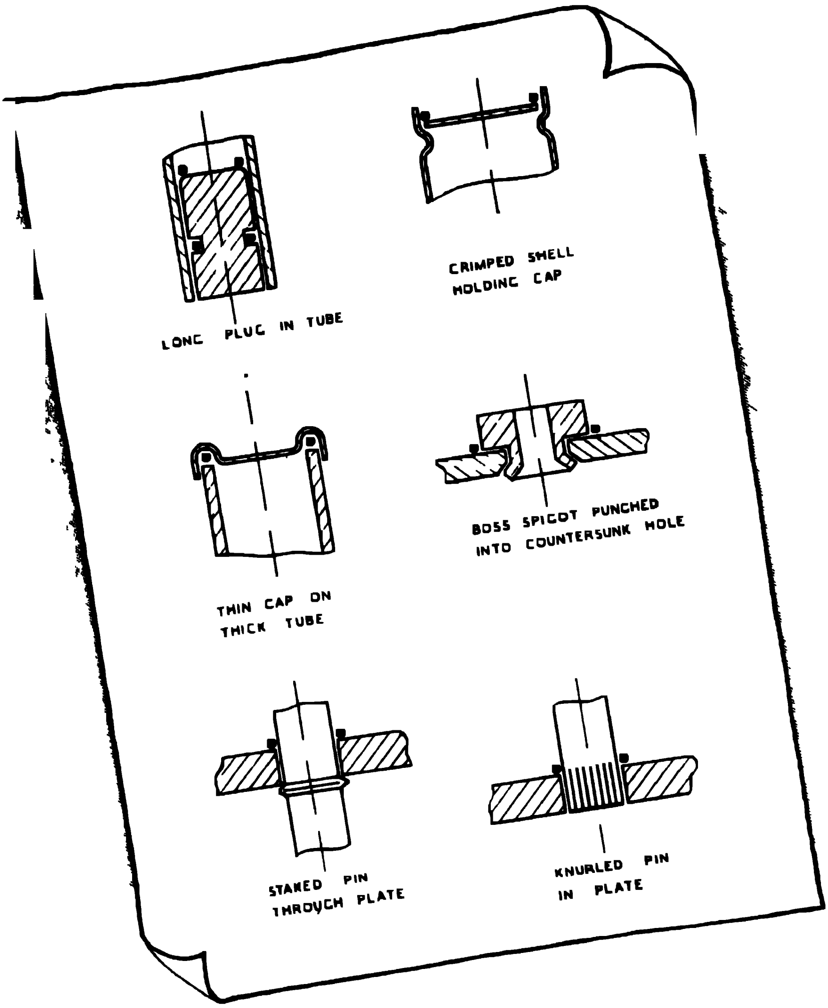


Figure 4—Standard joint designs for furnace and induction brazing.

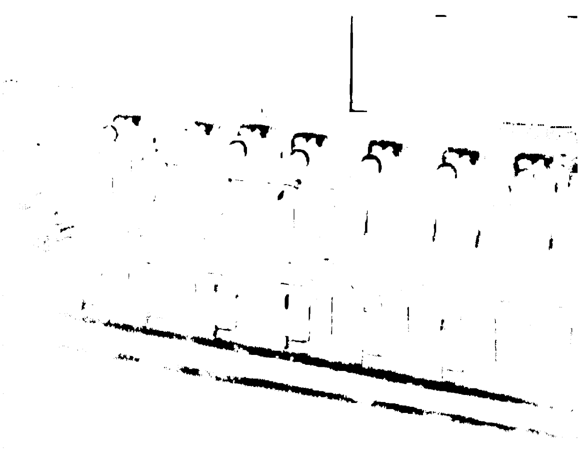


Figure 3 Where large quantities of similar components have to be brazed the mass production principle can be applied. Here is a multi-station arrangement for brazing automobile damper assemblies.

Courtesy—Newton Bennett Ltd.

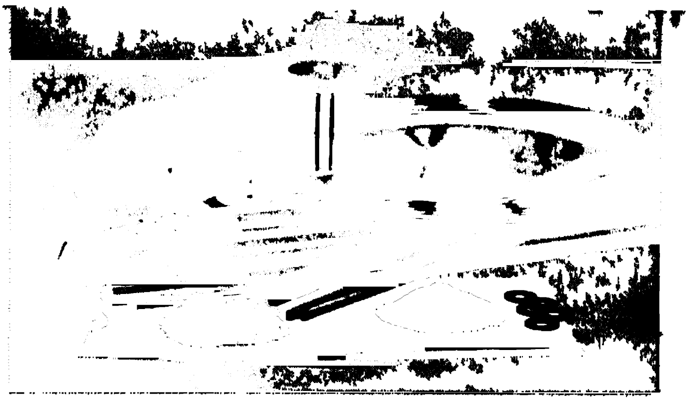


Figure 5—The wide range of available forms permits ready application of silver brazing alloys.

Courtesy— Johnson, Matthey & Co., Ltd.

Figure 6—Brass assemblies are brazed in a "pusher" type furnace. (Johnson, Matthey & Co., Ltd.)

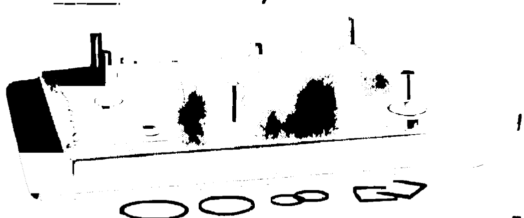


Figure 7—Eleven details assembled in one operation using pre-placed rings and washers. (Johnson, Matthey & Co., Ltd.)

Figure 6 illustrates the silver brazing in a reducing atmosphere semi-continuous muffle of brass channel assemblies, and Figure 7 shows an assembly of 11 mild steel details to a mild steel pressing carried out in a single operation in the simplest type of gas-fired open muffle In both cases, the brazing temperature is restricted to a maximum of about 67°C by the use of the silver-copper-zinc-cadmium brazing alloy having a liquidus temperature of 630°C

Induction Heating.

When it is required to make a brazed joint at one or more points of an assembly where the quantities required are large and the heating of the whole of the work would be uneconomical, induction heating shows up to maximum advantage Low temperature brazing alloys are particularly suited to induction heating for two reasons. One is that the most desirable feature of this heating method is the high speeds of heating permitted, this advantage is largely lost unless the brazing material itself will melt at a comparatively low temperature and will penetrate the joint in the shortest possible time after becoming molten In addition, temperature control in induction heating is largely contrived by ontrol of the time for which the secondary current is applied, and this control is made much less effective if appreciable time is taken for proper filling of the joint by the filler material

Of the types of induction heating equipment available, the vacuum oscillator is generally accepted as being the most adaptable to brazing. Such equipment is shown in Figure 8 brazing with a silver-copper-zinc-cadmium brazing alloy the two parts of a mild steel electric motor rotor of special design.

The joint design features necessary to observe for efficient use of induction heating are basically the same as in furnace brazing, although some modifications must occasionally be introduced, depending upon the type of inductor found to produce the desired heat pattern in the work.

Resistance Heating.

Particularly in the case of copper sub-assemblies for electrical applications and small parts in jewellery and optical manufacture, resistance heating by means of carbon electrodes made incandescent by the passage of a low-voltage current plays a useful part. This method shows to advantage where copper parts are brazed without flux, employing a silver-phosphorous-copper brazing alloy.

A further process which seems capable of more development in the future is that in which the assemblies to be brazed are heated, after pre-placement in or near the joint of the brazing material, by immersion in a bath of molten salts maintained by gas or electrical heating at a temperature exceeding the liquidus of the brazing alloy.

Conclusion.

The great flexibility of the family of brazing processes available to the engineer who employs the modern low temperature silver-bearing brazing alloys accounts both for the wide range of applications now current and will undoubtedly result in continued expansion of this assembly method in production engineering.

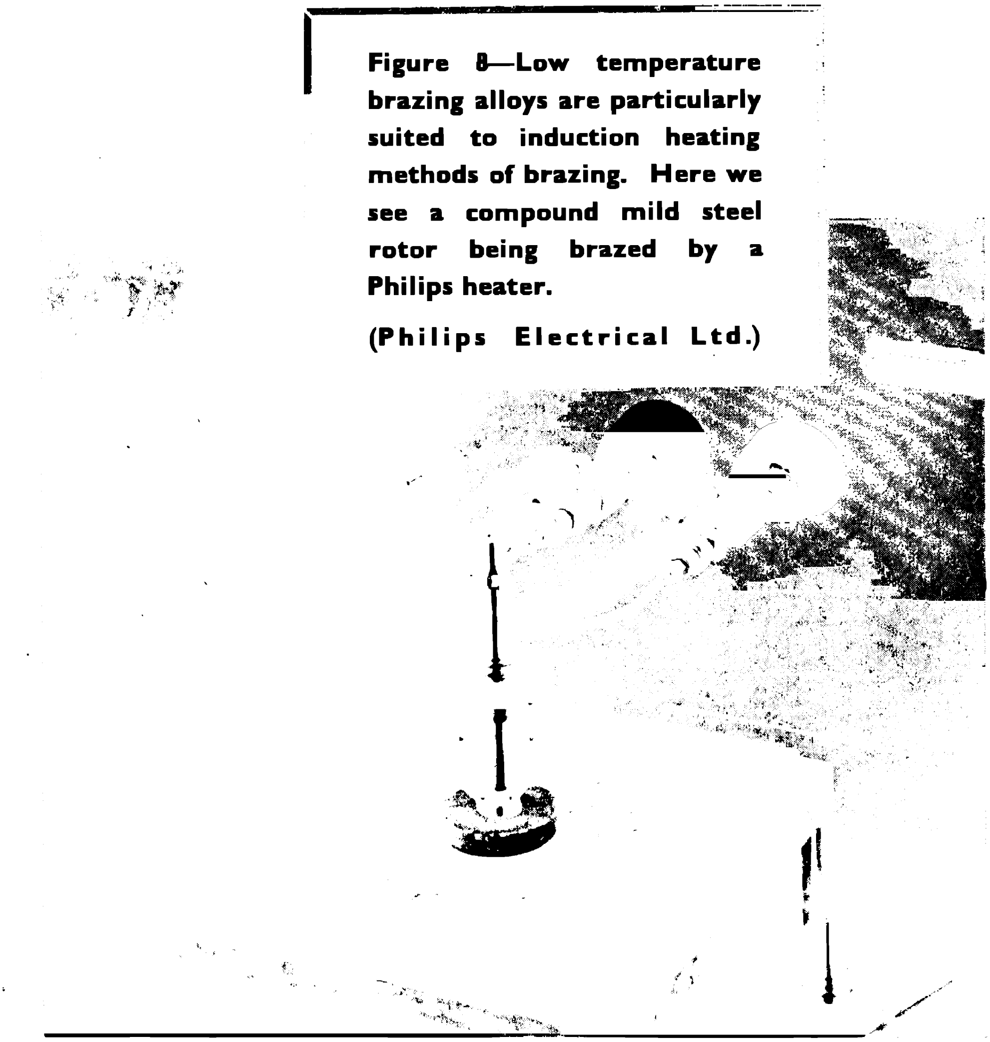


Figure 8—Low temperature brazing alloys are particularly suited to induction heating methods of brazing. Here we see a compound mild steel rotor being brazed by a Philips heater.

(Philips Electrical Ltd.)

By Our Market Correspondent.

The Commodity Markets

Reorientation of Values ; Price Freezing Policy

SINCE the start of the break in American commodity prices on 4th February, with the "smoking out" of grain speculators a world-wide deflationery trend has been set in motion.

This definite check to the will-o'-the-wisp spiral uptrend, which has gone on so long against the interests of manufacturers and consuming industries, presaged a downward move in the price-level of basic commodities. In the Spring of last year a fall in values was seen but later followed by a reversal move. Conditions have, however, changed and bearish factors now in evidence promise a return to normality which cannot fail to disintegrate any existing artificial conditions. Economists are banking on what they call "a healthy recession"; that is to say a gradual decline from inflation to a level still well above pre-war.

Emphasis on our position at home triggered off the Government's clarion call and the initiation of the Board of Trade's Price Orders; they cover goods from walking sticks to shove-ha'penny boards, candelabra to curry combs and seem to reach the reductio ad absurdum of official interference, but have been put forward as being necessary in the price standstill policy.

Non-Ferrous Metals.

Although there is no direct connection between wheat and base metals, psychologically, and to some extent factually, commodity prices do tend to move as a whole, but so far, quotations for copper, lead, sinc, etc., have not been affected. American domestic quotations form the basis of those ruling in the International dollar market, which also remain unchanged, and those quotations also form the basis—subject to a short time-lag—on which Empire producers of copper, lead and zinc are paid by the Ministry of Sunply.

American supplies of sterling metals available to outside buyers are small. With LEAD, there has been a fall in the buying pressure exerted on world supplies by U.S. demand, but this is a welcome factor, as there is still an acute world scarcity of the metal. Soft foreign pig (duty paid) remains at its fixed price of £90 per ton.

There is no change in COPPER; electrolytic remains pegged at £132 per ton.

Following expressions of dissatisfaction by Malayan TIN producers, discussions have taken place between representatives of the industry and the Ministry of Supply and the Colonial Office. The object has been to secure some premium on Straits tin which the Ministry's bulk buying price of £500 per ton does not afford in relation to prices to other producers.

Zinc's Invidious Price : Scrap.

Does sterling ZINC, like sterling Copper, claim a higher price than American metal? That is the question many manufacturers are asking as at £75 per ton, the British price of Zinc is considerably higher than the New York level (nearly £67), and the disparity cannot be entirely accounted for by higher freight costs.

In 1947 Britain imported 90 per cent. of its requirements of Zinc Ore and concentrates from the Commonwealth, but out of a total import of 149,000 tons of Zinc and Spelter during the year, the U.S. supplied nearly 58,000 tons and British countries 79,000 tons.

Although world Zinc production is still below the pre-war level, demand has surpassed its pre-war rate. Galvanised products are still in great demand and absorb 45 per cent. of current consumption.

The British internal market in SCRAP METAL had a break a month or so ago and prices for Copper, brass and gunmetal were down, but an upward fluctuation has since taken place. There are no signs of anything like the quantity of secondary metal coming out as last summer when non-ferrous metal prices had the first setback in their long post-war rise.

Steel and Timber.

Although still earmarked for Nationalisation, the STEEL industry is progressing under private ownership and output continues to beat records.

Some twenty-four projects for the expansion of modernisation of the industry in this country will be completed this year and add another 400,000 tons to production capacity. It is said, however, that unless 500,000 tons more scrap than last year are obtained from home sources, the 1948 output target of 14 million ingot tons cannot be attained.

The Government's revised scheme for the distribution of iron and steel, is in its essentials the old scheme but more stringent and the new I.S. Authorisation currency forms took effect on 1st April.

The tide of TIMBER imports from Sweden and Finland is increasing and good arrivals of pine are reported from Canada. A fall in prices is expected especially if the delivery of Russian timber takes place in about May when the Baltic ports will become ice free.

On account of printing exigencies, Commodity prices and indices mentioned above were struck on a certain day during the month; alteration in price movements since then must be allowed for.

Continued from page 55.

tendency would result in establishment and usage of motion elements so fine as to be of value only to medical and psychological research workers. But, as will be explained in detail when considering fatigue and monotony, learning curves and aptitudes, etc., understanding of some of the extremely small elements which go to make up a complete therblig, is of value in getting an insight into what is really taking place and attempting to assess the "human factor" in industry.

The therbligs in Table I are applicable to work done with the feet, as well as the purely mechanical aspects of mental tasks; they can be studied simultaneously for the operator and a machine attended by him, or for a machine or process alone.

Of these eighteen units, two deal with delays and will for the moment be excluded from further discussion, since these really are a matter concerning the efficiency of the plant and its method of operation rather than the operator himself.

Any kind of human activity can be split up into the above therbligs, although they may not all be present in any one operation.

It is obvious that every element listed in Table II is a functional unit based on the nature of the task itself, and incorporating a number of therbligs.

Examples of actual employment of therbligs in job analysis are given in Table III; such a break-down may be for the purpose of rate-setting or for research, establishment of improved working methods, i.e. rationalisation of the process, and for teaching purposes.

As an example of the practical value of therblig analysis it may be pointed out that in assembly work, to take only one instance, investigations into the way in which operators execute the therblig "grasp," has shown that there are a number of different grasps, each peculiar to work of a given size and weight.

This had led to development of more efficient and comfortable control handles, tool-grips, and storage containers. Similarly, investigations into "transport empty" and "transport loaded" have been utilised in development of more effective assembly tables and work benches, office desks, etc., with resulting advantages such as: simplification and speeding-up of necessary work, and reductions in fatigue, errors, low quality work, etc.

Therblig Time Standards.

After long investigations, the American General Electric Company and other firms and authorities have released details of standard therblig times and allowed the use of such data to all concerned. In particular, the operation "assembly" has been studied in great detail, and it is undoubtedly true to say that it is possible to transfer such information and recommendations from industry to industry, even from one technical process or craft to another; but great care is required in applying such data, and modifications may be necessary. Some schools of thought oppose this; their viewpoint may be discussed in a future article. Nevertheless, such transfer of quantitative motion study data from industry to industry should enable backward techniques to be rapidly modernised and improved. The compulsory condition which must at all times be observed is that accompanying environmental factors must also be transferred *and maintained.* In many cases this is impossible without re-organisation or radical changes in the existing conditions of factory organisation, labour relations, wage-structure, attitude of individual trade unions, design and layout of machines and equipment—insofar as this is in the hands of the equipment manufacturer—and legal and financial factors, as well as governmental or trade association direction, assistance, or control.

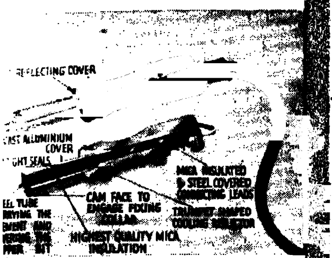
It may well be, that in the remote future, therblig standard times will be laid down and given legal and technical recognition through out the world. This is not as Utopian as would appear at first sight; there are powerful tendencies unconsciously driving towards this end.

Preliminary researches on a very wide scale would be necessary, and it is likely that such a movement would be accompanied by a universal usage of mass-produced tools, equipment and work-benches, etc., all designed in accordance with finalised motion study conclusions; it would be the end-point of necessary human labour of a routine kind, wherever it cannot be completely mechanised.

Meanwhile, industries which have not yet employed motion study to any considerable extent, have much to learn from those who have. It should interest all industrialists who are dismayed at the difficulties of re-equipment and uneasy about competition by rivals who are more fully mechanised or better organised. If we make more efficient use of the resources at our disposal, we could probably between us, more rapidly produce and install the new capital equipment needed to avoid being depressed into a technically backward power. Again, industrial and agricultural developments being promoted in colonial areas have much regarding motion study, which they can learn and utilise, we hope, to our mutual advantage.

Review of EQUIPMENT

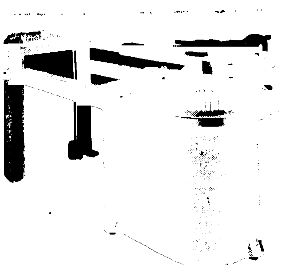
Electric Soldering Irons



The illustration shows a new type of electric iron developed to eliminate the usual troubles with other types of iron. The element is sealed in a special chamber and is shock and crash proof to an unusual degree. A leaflet describing it is available from the makers.

Supplier :—**Acru Electric Tool Mfg. Co. Ltd.,** 123 Hyde Road, Ardwick, Manchester 12.

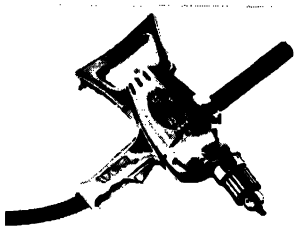
Tube Benders



Here is an illustration of the MD2 Motorised Mandrel bending machine. It is a representative example of the type of machine marketed by the makers for use in the manufacture of tubular furniture, exhaust pipes, cycle parts, sanitary flushpipes, etc., Most of the machines are suitable for the production of repetition bends to small radii without distortion or restriction of the bore.

Supplier :—**Hilmor Ltd.,** 65 Calshot Street, Kings Cross, London, N.1.

Electric Drills



A new General duty electric drill has been introduced by the "Wolf" people. It is of ½ in. capacity and is known as Type SD4C. The price is quoted as £11 10s. 0d. A drill stand (Type ES12) is offered to go with it.

Supplier :—**S. Wolf & Co.,** Ltd., Hanger Lane, Ealing, London, W.5.

Nail Making Machinery

"Greenbat" nail making machines, of which this illustration shows a typical example, can make nails in a number of sizes from ⅜ in. to 10 in. in length and from .042 in. to .300 in, in diameter. For large-headed nails a double blow machine is necessary as two blows are required to form the head. Our illustration shows a machine of this type. A leaflet is available from the makers.

Supplier :—**Greenwood & Batley Ltd.,** Albion Works, Leeds.

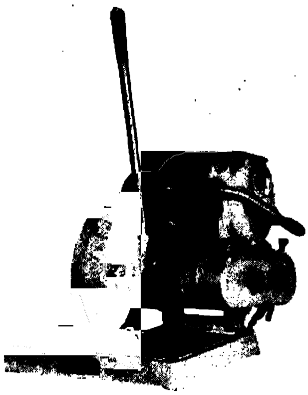
Power Presses

The "Besco" Type EB Eccentric Punching Press is provided with adjustable stroke, rise and fall table and a safety, non-repeat action clutch giving continuous or non-repeat action at will. We understand that the first four sizes of this machine are available ex stock and larger sizes on short notice.

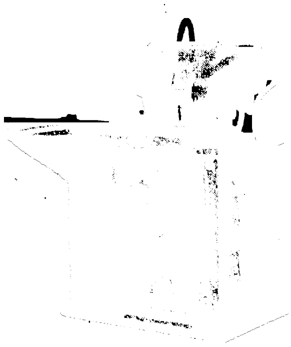
Supplier :—**F. J. Edwards Ltd.,** 359-361 Euston Road, London, N.W.9.

Review of EQUIPMENT

Parting-off Machines



Our illustrations show two models of the Osmond cutting or parting-off machine which is available in a number of different combinations to suit specific jobs. As a bench machine (see upper photo) it can be used for cutting brass, steel, aluminium, cast iron, bronze, or wood. Special



wheels are supplied to suit the various materials, some being abrasive wheels and others being true saw tooth wheels. The machine is also supplied mounted on a cabinet type stand, as shown in the lower illustration, in this particular case it is equipped with a material clamp to hold the work being cut. The saw head is mounted on a rocking frame which is pulled forward and downward as the cut proceeds. The capacity is: solids up to ¾ in. diam., light gauge tubing etc., up to 1 in. diam., and light angle sections up to 1½ in. by ⅛in. A number of special fittings such as dust screens, coolant pump fittings, exhaust extractors, graduated scales, etc., can be supplied to special order.

Supplier :—**A. & S. Osmond Ltd.,** 256 Hotwell Road, Bristol, 8.

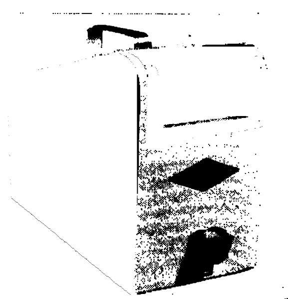
Steam-heated Dryer

The Gardner Patent Steam Heated " Rapid " Dryer, with " U " shaped steel trough, jacketed for steam in which revolves the agitator, is well known. Our illustration shows a standard machine assembled 3 high to provide continuous operation. The material enters the top at the driving end and, by overflow discharge, passes from No. 1 to No. 2 then from No. 2 to No. 3 and out at the bottom of the machine. As will be seen the assembly makes a compact machine, often accommodated in a corner of a room, displacing the older and more clumsy types of drying room or stoving apparatus.

Supplier :—**Wm. Gardner & Sons (Gloucester) Ltd.,** Bristol Road, Gloucester.

Pest Control Apparatus

Every year enormous damage is done to foodstuffs, textiles and other commodities by insects, moths, etc. Disease is spread by flies, and epidemics of sickness cause absenteeism. Much of this

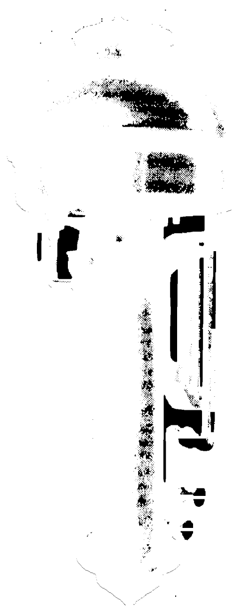


loss can be avoided by the use of the apparatus shown in this

column. The upper illustration shows a portable " Phantomyser " Model PD1, intended primarily for large factories, etc., the lower illustration is of a smaller model (the PD2) for use in offices, laboratories, hotels, etc. A special booklet describing the principles of Aerosol Technique is available on request from the suppliers of the equipment.

Supplier: **Aerosols Ltd.,** 65 Old Brompton Road, London, S.W.7.

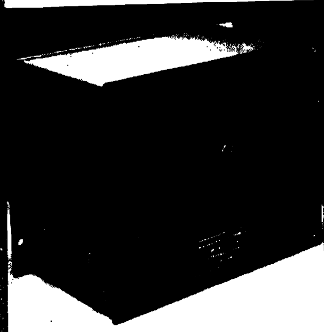
Water Stills



The illustration above shows one of a range of automatic water stills for producing a supply of high quality distilled water at low cost. Models are available for operation by steam, electricity, oil or gas.

Supplier :—**Manesty Machines Ltd.,** Speke Hall Road, Liverpool, 19.

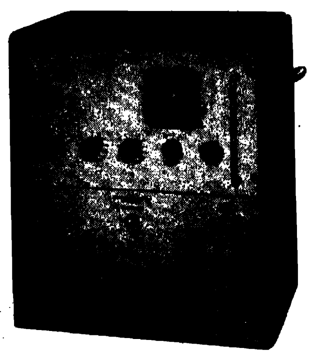
Flame Controllers



This plain looking box is the " Flamutroller," a device designed to give continuous supervision of combustion in gas or oil fired furnaces. Its action is instantaneous on flame failure, thus preventing accumulation of unburned fuel and consequent risk of explosion. The device can be arranged to cut off the fuel supply, merely to give audible warning or to perform both services.

Supplier :—**W. H. Sanders (Electronics) Ltd.,** Bedwell Lane, Stevenage, Herts.

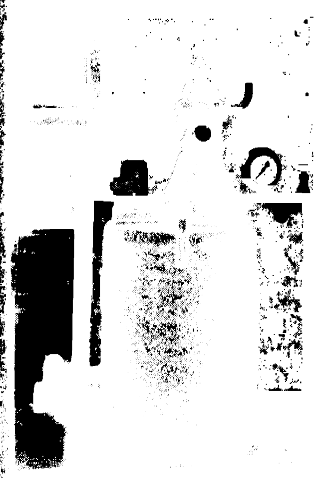
Industrial Amplifiers



The factory amplifier shown here can be supplied in either a 25 or 50 watt model and is designed to be ready for use by merely applying the mains and loudspeaker wiring. An advantage is that programmes may be interrupted for a special announcement by just pressing a button and the normal programme is resumed immediately the switch is released.

Supplier: **Birmingham Sound Reproducers Ltd.,** Claremont Works, Old Hill, Staffs.

Air Operated Pump



Advantages claimed for the "Ejectopump" are that gritty and corrosive materials can be handled as the operation is by air only and the product being pumped does not come into contact with the mechanism. A descriptive leaflet is available from the makers.

Supplier :—**Gresham & Craven Ltd.,** Ordsall Lane, Salford, Manchester, 5.

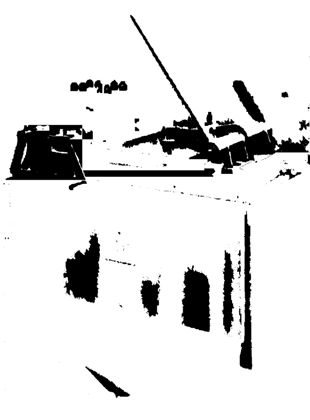
Review of EQUIPMENT

Throatless Shear

This device is specially designed to allow straight and curved cuts to be made with ease. It cuts clean and the edges require no serious attention afterwards. Blades are adjustable and can be removed quickly for re-grinding when necessary.

Supplier—**F. J. Edwards Ltd.,** 359-361 Euston Road, London, N W 9

Flash Butt Welder



This is a 70 KVA welder with a capacity up to two square inches on continuous production. The transformers and control gear are housed in the base and the main slides are mounted on the top of the frame. The left hand slide is fixed and the right hand is moved by an eccentric and lever. The point at which the cut-off operates is pre-determined, therefore the whole of the operator's attention can be given to the production of a sound weld. There are many other unusual features incorporated.

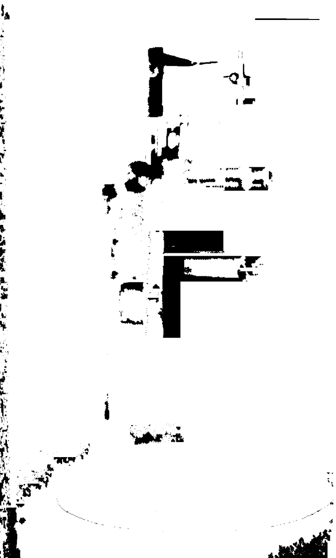
Supplier—**Standard Resistance Welders Ltd.,** Mucklow Hill, Halesowen

Automatic Cap Screwing and Tightening Machine

This silent automatic device can screw and tighten up to 25,000 bottle or can tops in an 8 hour shift. It handles caps up to 5 in diam and containers up to 18 in in height. The procedure is as follows, place bottle on platform, raise platform according to height of bottle, adjust tightening device to suit diameter of cap and the rest is automatic.

Supplier—**Richard Brandt,** Automatic Machines, 220-224 Pentonville Road, London, N 1

Liquid Dispenser



The Apis electronic dispenser has been designed to maintain absolute cleanliness and accuracy for filling small volumes of liquid. The machine consists of a filling head on a stand and a power unit. The head can be set to any required height. 1 cc containers can be filled at a speed of 2,000 per hour, larger sizes at proportionate speeds.

Supplier—**Apis Engineering and Research Ltd.,** 197 Abbotts Drive, Wembley, Middlesex

Forthcoming

M.O.S. AUCTION SALES

Date.	*Site of Sale.*	*Auctioneer.*
	Miscellaneous Stores.	
April 6th to April 9th.	M.O.S. Depot 45, Cannell Street, Ancoats, Manchester.	Ruston, Sons & Kenyon, 12, York Street, Manchester. Tel.: Manchester CEN. 1937.
April 12th to April 15th.	M.O.S. Depot, Church Road, Erith, Kent. (Sale of these stores will be held at Winchester House, Old Broad Street London E.C.2.)	Leopold Farmer & Sons, 46, Gresham Street, London, E.C.2. Tel.: Monarch 3422.
April 13th.	R. S. Depot, Barlow, Nr. Selby, Yorks.	Bartle & Sons, 5 6, Corn Exchange, Leeds. Tel.: Leeds 24621.
April 13th to April 16th.	M.O.S. Depot 1, Royal Arsenal, Woolwich.	Wheatley, Kirk Price & Co., 2, South Audley Street, W.1. Tel.: Regent 7150 and 7159.
April 15th.	M.O.S. Depot 91, Bainton, Nr. Stamford, Lincs.	Messrs. Richardsons, 15, Barn Hill, Stamford. Tel.: Stamford 3315.
April 20th to April 22nd.	M.O.S. Depot 7, 92, Woodlands Avenue, Eastcote Ruislip, Middlesex.	Fuller, Horsey Son & Cassell, 10, Billetter Square, E.C.3. Tel.: Royal 4861.
April 21st to April 23rd.	M.O.S. Depot 150, Ramsbury Airfield, Ramsbury, Wilts.	Hooper, Finniger & Co., 130, High Street, Marlborough. Tel.: Marlborough 41.
April 22nd to April 23rd.	M.O.S. Depot 93, P.O.L. Site, Eardisley, Hereford.	Russell, Baldwin & Bright, 20 King Street, Hereford. Tel.: Hereford 2184.
April 26th to May 7th.	M.O.S. Depot, Yeadon, Leeds.	Oliver, Kitchen & Flynn, 30, Albion Place, Leeds, 1. Tel.: Leeds 20681 2.
April 27th to April 28th.	M.O.S. Depot 99, Weyhill, Andover, Hants.	Henry Butcher & Co., 73, Chancery Lane, London, W.C.2. Tel.: HOL. 8411
April 27th to April 29th.	M.O.S. Depot, Honeybourne, South Littleton, Nr. Evesham, Worcs.	Bosley & Harper, Shipston-on-Stour. Warwick, Tel.: Shipston 2.
April 28th to April 29th.	M.O.S. Depot 77, Dundonald Aerodrome, Drybridge, Ayrshire.	Thomas Donald & Sons, Kilmarnock Auction Mart, West Langland Street, Kilmarnock. Tel.: Kilmarnock 285.
	Vehicles, etc.	
March 15th to April 8th.	M.O.S. Depot, Byram Park, Brotherton, York.	Hollis & Webb, 3, Park Place, Leeds. Tel.: Leeds 29671/2.
April 6th to April 23rd.	M.O.S. Depot, Mount Farm, Nr. Dorchester, Oxon.	Simmons & Sons, 12, Station Road, Reading. Tel.: Reading 4025/26.
April 8th to April 9th.	M.O.S. Depot, Duddingston, Edinburgh.	The Berwick Auction Mart Co., Market Square, Duns, Scotland. Tel.: Duns 2.
April 26th to May 11th.	No. 31 V.R.D., Douglas, Lanarkshire.	Lawrie & Symington Ltd., Lanark, Scotland. Tel.: Lanark 280.
April 27th to April 29th.	M.O.S. Depot, Elstow, Beds.	Peacock, Merry & Swaffield, 10, Lime Street, Bedford. Tel.: Bedford 3115.
	Radio and Photographic Equipment.	
March 31st to April 9th.	M O.S. Depot 121, Ashchurch, Glos.	Bruton Knowles & Co., Albion Chambers, King Street, Gloucester. Tel.: Gloucester 2267 and Geo. Hone, 120, High Street, Tewkesbury. Tel.: Tewkesbury 10.
April 14th.	Admiralty Storage Depot, Risley, Nr. Warrington.	Outhwaite & Litherland, 3, Eberle Street, Liverpool, 2. Tel.: Liverpool CEN. 6561.
April 20th to April 22nd.	M.O.S. Depot 123, Norton Fitzwarren, Taunton.	F. L. Hunt & Sons, 9, Hammett Street; A. W. Parker & Co., 53, East Street; W. R. J. Greenslade & Co., 3, Hammett Street, Taunton. Tels.: Taunton 2743, 2101 and 2601.
	Miscellaneous Radio and Electrical Equipment.	
March 31st to April 1st.	R.A.F. M.U. No. 35 Sub-site, Bowlee, Nr. Manchester.	C. W. Provis & Sons, 2, Booth Street, Manchester. Tel.: Manchester CEN. 2800.
April 6th to April 8th.	M.O.S. Depot 162, R.O.F., Wrexham, Denbighshire.	G. F. Singleton & Co., 53, King Street, Manchester, 2. Tel.: Manchester Blackfriars 2264/5.
April 13th to April 15th.	R.A.F. M.U. No. 7, Quedgeley, Glos.	J. Pearce Pope & Sons, St. Aldgate Chambers. Gloucester. Tel.: Gloucester 2274.
April 21st.	R.A.F. M.U. No. 16, Sandon Road, Stafford.	South & Stubbs, Bank Passage, Stafford. Tel. Stafford 82.
April 22nd to April 23rd.	R.A.F. M.U. No. 25, Hartlebury, Kidderminster, Worcs.	Nock & Joseland, Bank Buildings, Kidderminster Tel.: Kidderminster 2053.
April 28th to April 29th.	R.A.F. M.U. No. 61 Sub-site, Cranage, Nr. Middlewich, Cheshire.	Brady & Son, 17, Warren Street, Stockport. Tel. Stockport 2252/3.
	Miscellaneous R.A.F. Stores and Equipment.	
April 6th to April 7th.	R.A.F. M.U. No. 70, Goring Heath, Nr. Reading.	Messrs. Nicholas, 1, Station Road, Reading. Tel.: Reading 4441.
April 12th to April 14th.	R.A.F. M.U. No. 255 Subsite, Balderton, Nr. Newark, Notts.	Escritt & Barrell, Elmer House, Grantham, Lincs. Tel.: Grantham 1035/6.
April 20th to April 23rd.	R.A.F. M.U. No. 264 Sub-site Alconbury, Huntingdon.	Dilley Theakston & Beardmore, Market Hill, Huntingdon. Tel.: Huntingdon 7.
April 26th to May 6th.	R.A.F. M.U. No. 262, Eccles, Norwich, Norfolk.	Thos. W. Gaze & Son, Crown Street, Diss Norfolk. Tel.: Diss 13.

Although it is anticipated that these sales will take place on the dates shewn, they should be taken as *tentative*, but the change of dates, if any, will only be a few days.

Lists of the type of stores to be included in the sales are not yet available, in the majority of cases they will be of a miscellaneous character: Electrical, Mechanical Plant and Equipment and Textiles, at each sale.

PLASTICS

Bag Moulding by W. S. PENN, B.Sc.

To the outside observer the plastics industry is essentially concerned with the moulding of relatively small parts, the largest in their minds being about the size of a wireless cabinet. Many requests are often received by the plastics industry, however, for very large mouldings. These uninformed enquirers ask if it is possible, for instance, to have moulded a bath, sink, boat hull and many other similar objects from the same material as is used to mould a wireless cabinet. There have also been many frivilous remarks about the possibility of moulding car bodies. It is the object of this article to illustrate how far the plastics industry can go in this direction and by what means large mouldings may be produced.

Ordinary Mouldings.

In order to mould objects such as bowls, trays, wireless cabinets and the like from moulding powders, it is necessary to employ special steel moulds. These are frequently fairly complicated and consequently expensive. It is therefore only economical to mould these objects from plastics if large numbers are to be produced.

Now, theoretically, there are no limitations as to the size of a steel mould and it should be possible to manufacture one for a bath or car body. Such moulds, however, would clearly be very expensive and it would be necessary to mould a very large number of these objects to make the process economical. The number required would run into many thousands and possibly, into the hundreds of thousands. Obviously, this is quite impossible, since not only is it impracticable for most firms to produce on such a large scale, but it is undesirable to manufacture such a large number of objects from one particular design. The manufacturer wants his design to be fairly flexible and for this reason alone such large moulds are excluded. In any case it would be necessary to employ special impact moulding powders to give the required strength and the moulding pressure and size of presses needed would be prohibitive.

To take a typical example, let us say that a projected surface area plus the allowance for the depth of a bath would be about 2400 sq. ins. About 3 tons per square inch moulding pressure would be required, making a total tonnage of at least 7,200 and probably more. This would be a very large press indeed.

In view of these obvious limitations, it is necessary to enquire how, therefore, or is it possible at all, to produce large plastic mouldings. The answer is in the affirmative and there are two principal methods. The one is by the utilisation of bag moulding employing the use of laminates and the other is the formation of pulp resin preforms, employing normal type moulding powders. The former forms the subject of this article and the latter will be described in the next issue.

Principle of Method.

There is virtually no limit to the size of the object which may be produced by bag moulding. A typical example of a modification of this method was the production of Mosquito aeroplanes during the war. The interesting feature of bag moulding is that the shaping surface, replacing the steel mould can be made from any cheap material, such as wood, concrete or plaster of paris. These materials are cast or shaped to that of the article which is required. On this surface is then built up the moulding by first of all laying a thin veneer of fabric, wood or other material over the surface and then covering with a fast curing "contact" resin. These resins are specially designed to cure quickly and under a small pressure and they are already incorporated into the veneers by impregnation. Further layers of veneers are then applied until the desired thickness is built up. It will be realised that these veneers can be cut or tailored beforehand to fit the surface to which they are to be applied, thus giving the required shape of the object.

We now have the uncured moulding fitting fairly tightly on to the shaping surface and it is necessary to cure. For this purpose a flexible rubber bag is laid over the exposed surface and is inflated with hot air. The bag is also held in some container so that the application of air at a pressure to the bag applies pressure to the moulding wherever it may be required. At

the same time it also applies heat. Thus, a *uniform pressure is applied all over the moulding which is forced into close contact* with the shaping surface.

In this particular case it is only necessary to *employ* a pressure of about *200* lb./sq. in. and sometimes even less and this is termed a contact pressure. Using the same surface area of 2,400 sq. ins., mentioned above, a total pressure of only 215 tons is required. This is obviously a great reduction and illustrates the value of the method. In addition, the original objection of the costly steel mould and the variation in design is overcome. It is possible to change the design every few mouldings if required with very little increase in cost.

There is some loss in surface appearance because that high polish is not there which is possible with steel moulds. However, this is not always important and, in any case, the veneer itself will have a fairly good surface and it is not uncommon to paint or spray these large mouldings after manufacture.

To illustrate the versatility of this method, a modification of it may be mentioned, not involving the use of a bag, although very low pressures are required in conjunction with the use of contact resins. The fuselage of the Mosquito was produced by building the veneers round a former and then simply applying pressure by means of clamps in the form of steel rings. These were disposed at frequent intervals along the fuselage of the Mosquito and the whole set up was heated by radiant heating. The strength and durability of this aeroplane needs no description, illustrating the value of the technique.

Naturally, this method also has its disadvantages. For instance, the original advantage of the mass production of plastic mouldings is lost. The method once more relies on the hand production rather than automatic or semi-automatic means. Nevertheless, the principle has been fairly widely employed since at the time there were no other means of obtaining the same end. The method will probably continue to be used quite extensively because it is so flexible. Apart from the different shapes which may be produced, the developments in the production of veneers have been so great that many possibilities present themselves in this connection alone.

Veneers are now made from wood, paper, fabrics, cloth, glass or asbestos and even metal veneers have been employed for some purposes. All of these can be given various designs so that it is possible to produce a great variety of products.

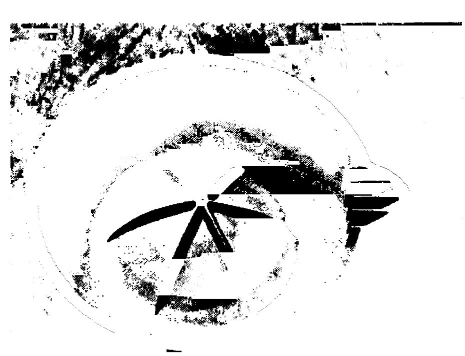
Finally, it may be mentioned that when it has been stated in the past that cars have been *made from plastics, this is what is* meant. They have been produced from veneers by a process similar to the one described above.

COMBINATION LEMON SQUEEZER - GRATER

THE photographs below emphasize the great advantages is using plastic moulding techniques for mass produced articles. The reversible design of the device is worthy of more than passing mention.

It has non-corrosive cutters moulded into one side and ribs on the reverse side to aid in the squeezing operation.

The ribs on the inner edge of the spout are to prevent pips and particles from passing into the container when pouring out the extracted juice. Being made from Beatl or Bakelite, the device does not taint the juice as would a metal or other material.



ENGINEERS' SMALL TOOLS

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HACKSAW BLADES
LATHE TOOLS
MARKING OUT TABLES
MILLING CUTTERS
MILLING TABLES
RING GAUGES—Plain and Screw
REAMERS, Machine, Hand, Floating
SLEEVES—Morse Taper
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Continued from page 64

applied by hand and finished by another machine. Large pies, such as the 4 lb. size, are made chiefly by hand.

The pies are passed continuously through a long double decker travelling oven on slowly moving trays, where, depending on the size and type of pie, they receive a baking of from 30 to 60 minutes. The speed is also adjusted in combination with the heat of the ovens to synchronise with the output of the rest of the factory. The pies are allowed to cool to a reasonable temperature and liquid gelatine is filled in to them to provide the jelly content.

On the way back we looked in at the spice room and watched the seasonings for pies and sausages being prepared. Twenty or thirty varieties of herbs and spices are used, all of them ground and prepared on the spot. As the time was then well on in the afternoon we had to think of getting back to town and we bid a reluctant farewell to our guide (it was pleasantly warm in the bakehouse and very cold out of doors) nevertheless, we had to come away.

Back in town, we fell to wondering how on earth we were ever going to do justice to the visit in the small space we knew we should have at our disposal. We came to the conclusion that much would have to be omitted. Thus the reader will find no mention in these pages of sections he will, perhaps, have looked for. He will look in vain for a description of the huge " dry-ice " plant for making solid carbon dioxide (it is out of use at the moment) nor will he find any mention of the brawns, galantines, savoury sausages, black puddings, etc., which are also produced at the factory. No description is given of the bacon factory, the huge compressor house, the garages and the cold stores. These, unfortunately, had to fall under the blue pencil of the space dictator ; perhaps—some other day.

Finally, as we go to press, comes another bit of news which we can just squeeze in ; —to relieve monotony on long-distance runs Wall's are installing car radio in their vans. It is believed to be the first time that radio has been fitted to commercial vehicles. The idea occurred to Mr. Cecil W. Rodd, the Chairman, after riding as passenger on a 200-mile night trip.

A census of what drivers listen to, says Mr. Rodd, shows that light music and variety programmes are most popular. Favourite programmes are Music While You Work, Much Binding in the Marsh, Melody Hour and Itma. One driver on his night runs listens regularly to music in the Third programme !

Books

DESIGN THIS DAY. *By Walter Dorwin Teague. Price £1 12s. 0d. Published by The Studio Publications, London.*

In this rather bewildering world, as we know it today, we welcome with deep appreciation any voice expressing confidence that there exists in man an inborn urge towards self-betterment. It is with just such an expression of faith that Mr. Teague reassures us in the opening chapter of his excellent book.

The evolution of man and the design and form of the myriad articles familiar to us in modern life may appear to be completely unrelated topics ; but the author demonstrates by logical reasoning that design has always marched hand-in-hand with man's advance through the ages. Furthermore, as surely as man's evolution must continue so must the design and form of his creations keep pace with this evolution.

The book dwells in detail with the influences which through the centuries have determined form and design—utility, mateials, methods of production—and exhorts the builder, the manufacturer, and the designer to continue to be guided by these factors. While paying full tribute to the craftmanship of the past the writer expresses the opinion that to follow slavishly the same pattern is poor artistry. Modern design, to be good design, must incorporate and mould itself to the full panorama of modern scientific knowledge, efficient production methods, and aids to better living.

Practising in the United States as an industrial designer, Mr. Teague has achieved a position of leadership in this field. His services were at the disposal of United States Army and Navy during the recent war and were held in such esteem that he received the Naval Ordinance Development Award, a unique honour for an industrial designer.

GAS COUNCIL'S VIEW OF NATIONALISATION

GAS nationalisation would create delay, difficulty and confusion at a time when co-operation and development are especially desirable, says the British Gas Council in a report issued in handbook form in view of the Bill now before Parliament.

The nationalisation structure, the report goes on, would impose upon the industry considerable additional expense which ultimately the consumer would have to bear;

it would substitute an experiment which could not readily be undone for a well tried, long established and remarkably successful method of providing by company and local authority enterprise an essential public service. The manufacture, distribution and utilisation of gas and the by-products of the industry is a highly specialised and technical business demanding individual initiative, responsibility, enthusiasm and inducement.

Declaring that the gas business is highly competitive and essentially suited to company and local authority enterprise and not to State management, the report says there is no evidence to show that nationalisation would result in cheaper gas or improved consumer service and good will. It follows this up with the contention that it cannot be established that only by nationalisation could co-operation on a national scale be achieved. Voluntary co-operation between undertakings has gone far and will go further, the council continues, many elements of centralised control which are advantageous have already been introduced.

A memorandum addressed by the Council to the Ministry of Fuel and Power last year is quoted as emphasising that "no form of amalgamation under nationalisation will be effective which ignores the importance of the local unit."

RADIO HEATER HARDENS PEN NIBS

We were recently privileged to see the tests of a special machine developed by Rediffusion Ltd. for a firm of pen nib manufacturers for the purpose of hardening certain portions of the nib.

This ingenious machine is shown in detail in the lower photograph, the nib blanks are fed in at the point (a), they slide down to the point (b) where they are detained by a stop then released to the point (c) where they enter the range of the heating coil.

The blanks are detained in this position by the stop (d) whilst the heating cycle occurs after which they are allowed to drop into the quench bath seen in the upper photograph.

The heating period is adjustable to suit varying metals and sizes of nibs. The entire cycle is automatic, following the insertion of a blank in the top chute. Time of heating is controlled by setting the dial to the required value.

PERSONALITIES

The executive staff of Philips Electrical Ltd. has recently been augmented by the appointment of **Dr. Robert Charles Gooding Williams, M.I.E.E., M.I.Mech.E.,** to the position of Chief Engineer. Dr. Williams, by experience gained while with the North American Phillips Co., Inc., is well qualified to fulfill his present function—that of technical advisor to the Managing Director.

Five more employees of the Triplex Safety Glass Co., Ltd., have been elected to the board, viz.: **Mr. H. W. Baker, B.Sc. (Eng.),** chief engineer; **Mr. C. L. Cripps,** manager of Willesden factory; **Mr. J. W. Follett,** general sales manager; **Mr. A. G. Rose, A.C.W.A.,** general manager King's Norton Works; **Mr. A. C. Waine, Ph.D., B.Sc.,** head of research department and chief chemist. **Mr. Arthur Cochrane,** a director, becomes assistant managing director; **Mr. B. H. Turpin** joins the board of Quickfit and Quartz, Ltd., a subsidiary; and **Mr. Kenneth Horne,** sales director, joins the board of another subsidiary, Lancgaye Safety Glass (1934) Ltd.

Mr. C. A. Burton, M.Inst.W. has been appointed sales manager of Sciaky Electric Welding Machines Ltd., Farnham Road, Slough, Bucks. He joined the company in 1934 and is the author of several papers on branches of resistance welding technique.

Mr. Joseph Walton, an Assistant Managing Director of Thos. W. Ward Ltd., Albion Works, Sheffield, has been appointed Chairman and Managing Director of the Darlington Railway Plant and Foundry Co., Ltd., and **Mr. Phillip T. Ward** has been appointed a Director of the Darlington Company.

Mr. R. F. Hewson, formerly in charge of production control in the Willesden Triplex Works plastics department, has transferred to the sales staff; **Mr. J. E. Sharpe,** who has been chief administrator in the Indian Ordnance Department for 14 years, succeeds Mr. Hewson in production control.

Mr. H. Young, who has been associated with the British Industries Fair since 1922, has been appointed Deputy Director of the Fair, in view of the increasing responsibilities of the Director (Mr. R. E. J. Moore).

Mr. N. E. Kearley A.M.I.E.E., Deputy Director of the Council of Industrial Design, resumed duty on 1st February with the Ministry of Supply, in the Electrical Plant Division, having completed his period of loan to the Council from the Civil Service.

Mr. Gilbert T. Beach, secretary of the Gauge and Tool Makers' Association, accompanied by seventeen members of the Association, are to visit the United States and Canada next month. The primary objects of the trip are to attend the convention of the American Society of Tool Engineers and to study North American tool production methods and prices.

Mr. J. P. D. Coleman has retired from the board of Wild-Barfield Electric Furnaces, Ltd., Watford, Herts., and of their associated company, Messrs. G. W. B. Electric Furnaces Ltd. He had been works director since 1933.

Mr. A. J. Payne has joined the research station of the Distillers Co. Ltd., at Tonbridge.

Mr. George Brearley has been appointed managing director of Brotherton & Co., Ltd.

Mr. S. Markland, O.B.E., M.I.Mech.E., director and chief engineer of Leyland Motors Ltd., and **Mr. N. Tattersall, M.I.Mech.E.,** Leyland research engineer, have been awarded the Starley Premium by the Institution of Mechnical Engineers for their recent joint paper entitled: "Some Notes on the Design, Development and Production of High-speed Compression-ignition Engines."

Mr. J. Frisken is now works manager at the Immingham factory of Fison's Ltd.

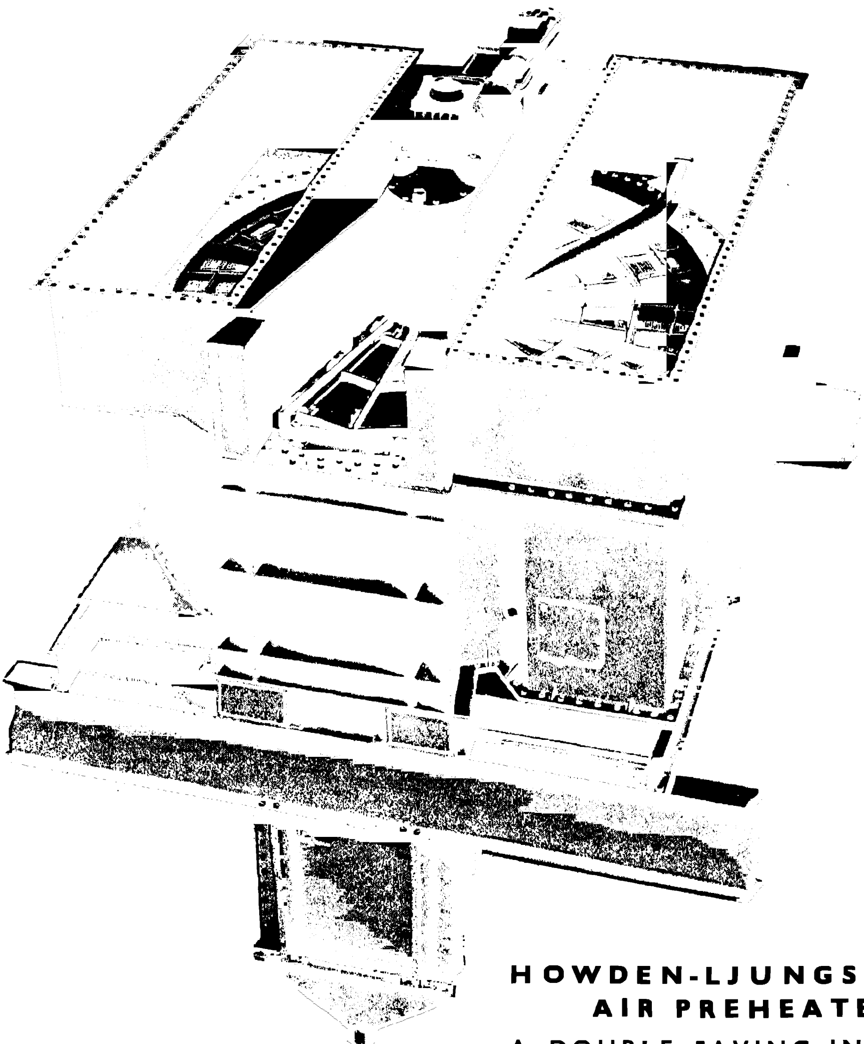
It is announced that **Mr. H. O. S.Bridcutt** has resigned from the Directorship and General Managership of Dulrae Manufacturing Company Limited, and is succeeded by **Mr. E. T. Shopland.**

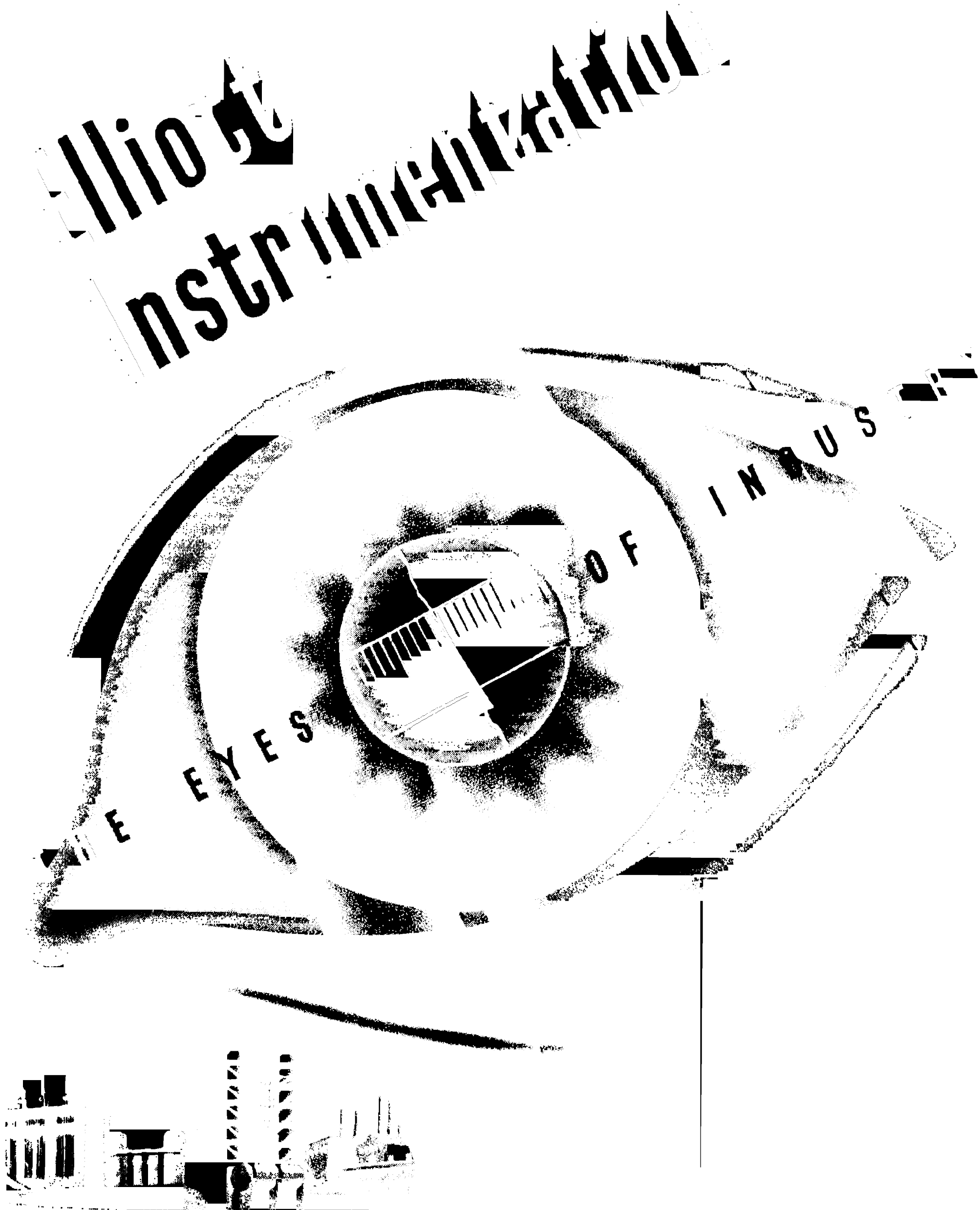
Mr. W. E. A. Cullum, previously production manager, became general manager of the Morris Motors Ltd. Cars Branch at Cowley in changes which were effective on February 1. **Mr. J. R. Woodcock,** previously works manager, became production manager; **Mr. R. E. T. Couch,** previously works superintendent, became works manager, **Mr. W. Jones** became works superintendent and **Mr. F. C. Achurch** service manager.

Mr. Thomas Hayes has taken up the appointment of chief chemist with John Nicholson & Sons Ltd., of Hunslet.

Mr. C. M. Tubb has returned from South Africa, and has accepted a post with Murgatroyd's Vacuum Salt Co. Ltd., Middlewich.

Mr. R. L. Kennedy has joined the Wellcome Foundation as Control Engineer.





G R

Third Sale

By Order of the Minister of Supply

Without Reserve

DEPOT No. 93, P.O.L. SITE

EARDISLEY, HEREFORDSHIRE.

(about 14 miles West-North-West from Hereford)

Russell, Baldwin & Bright Ltd.

are instructed to

Sell by Auction

on

Thursday and Friday, April 22nd and 23rd, 1948

at 11 o'clock each day

A Quantity of Valuable

GOVERNMENT SURPLUS STORES

PLANT and EQUIPMENT, including

Gas and Electric Furnaces, Generating Sets, Disinfectors, Compressors, Welding Plant, Transformers, Paint Spraying Equipment, and Hydraulic Motors.

Welded Steel Tanks Portable Hand Crane

A large Selection of fan Belts, Power factor meters, Cabling, Pulley Blocks, Triplex Glass, Turning Tools and Broaches, Volt Meters, Nylon Cord, Switch Fuses, Wire Brushes and Wheels, Switch Gear and Contactor Panels, etc

Miscellaneous A.R.P. Equipment

including Blankets, Bedding, Underclothing, Socks, Waterproof Suits, Coats and Overboots, First-Aid Boxes and Haversacks A large number of Felt Pads, Canvas Seats and Sorbo Cushions, Aluminium push and kicking Plates, etc

Admission (On View Days and Sale Days) on production of Catalogue only One Catalogue will admit Two Persons on View Days and One on Sale Days

View Days The Goods may be viewed on Tuesday and Wednesday, April 20th and 21st, between the hours of 10 a m and 4 p m and on Sale Days from 9 a m to 10 30 a m

Catalogues Sixpence each (Postal Orders only) may be obtained from the Auctioneers' Offices, 20 King Street, Hereford (Tel 2184), also Leominster, and Tenbury Wells ; and on Sale Days and View Days at the Entrance Gate of the Depot

GOOD NEWS FOR PRESS USERS!

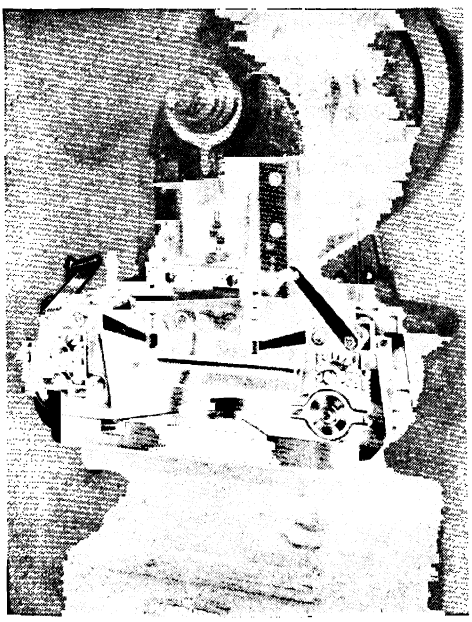
THE HUMPHRIS DOUBLE ROLL FEED

Humphris' Ten Ton Overhung Crank Press is already established in favour. Now, as the second step in the post-war programme of Press specialisation, comes the Humphris Double Roll Feed Type HRF-2.

★ Precision machined, of first class workmanship, this roll feed comprises a fully hardened, instantaneous grip and release friction-drive mechanism for the rolls. All feed rolls are hardened and all working parts are of robust construction and designed to give a long and accurate working life. The lower rolls are controlled by brakes, thus overcoming inertia of the moving parts and taking up any backlash which might occur in the drive. This ensures accurate feed. A mechanical roll release is incorporated for use when pilots are employed. An independent hand release is provided. Adjustments for feed length are simple and sure and the roll feed can be provided for feeding stock from left to right and from right to left. It is supplied complete with a separate interchangeable bolster plate. Special rolls, to customers' requirements, can be supplied.

Primarily designed for use with the HUMPHRIS Ten Ton O.C. Press, this feed is a valuable ancillary to other presses. Max. feed 3 in. Max. width of stock 4 in.

EARLY DELIVERIES



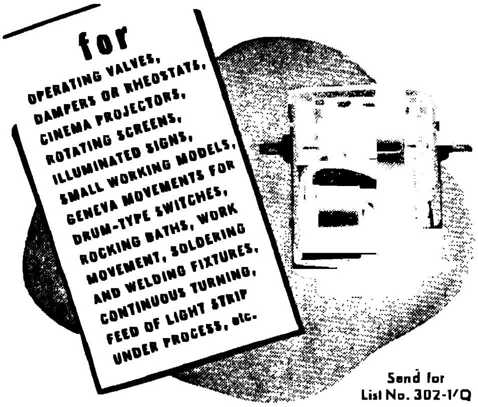
The Humphris Double Roll Feed on the Humphris Ten Ton O.C. Press. Supplied fitted complete to special interchangeable bolster plate. (Guards removed.)

Rear view, showing flywheel connection with calibrated adjustment. (Guards removed.)

HUMPHRIS & SONS LTD. **31 Park Road, Parkstone, Dorset.**

Telephone: Parkstone 2260-1-7 Telegrams: HUMPSONS, Parkstone

SMALL GEARED MOTOR UNITS



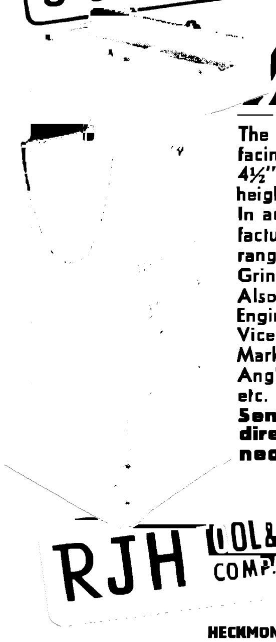
Send for List No. 302-1/Q

Drayton "RQ" motors are unidirectional, reversing or continuous running for 100/110 or 200/250 volts A.C

FINAL SHAFT SPEEDS:
Reversing 600 R.P.M./27 min. per rev.
Unidirectional 250 R.P.M./60 min. per rev.
TORQUE: 60 lbs. in. max.
CONSUMPTION: 25 Watts. (RQ5)

Drayton Regulator & Instrument Co. Ltd.
West Drayton, (*West Drayton 2611*) Middlesex

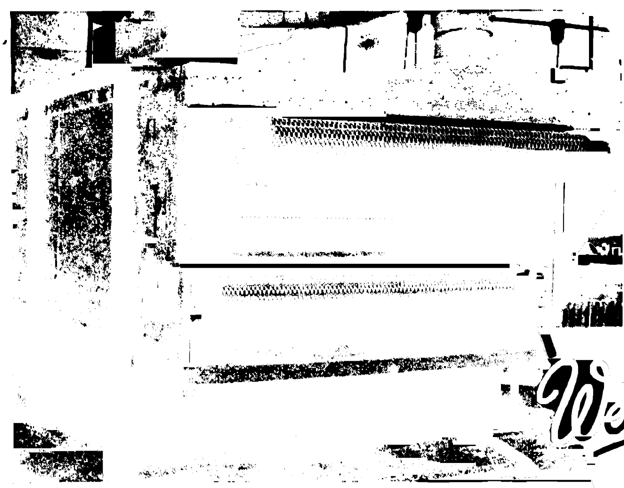
8" SPEEDFACER



The answer to rapid surfacing to .002 limits up to 4½" wide irrespective of height or length.
In addition we are manufacturers of a complete range of Endless Belt Grinders.
Also manufacturers of Engineers' equipment:—Vices (Inclinable Type), Marking-off Tables, Multi Angle Jigs, Suds Pumps, etc.
Send for details direct or ask your nearest tool dealer.

RJH TOOL & EQUIPMENT COMPANY LIMITED
ARTILLERY STREET, HECKMONDWIKE, YORKSHIRE.
Telephone: Heckmondwike 490

WOVEN WIRE CONVEYOR BELTS FOR EVERY APPLICATION



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Just one of our applications to suit our client's requirements. We may be able to speed your production too; ask our Technical Advice Representative to call.

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dm BWI7

TOWELS
without TROUBLE

NO COUPONS NO LOSSES
NO LAUNDERING

"KWICKDRY" ROLL TOWELS
(A "FLORINE" PRODUCT)
are made by Paper Specialists of World Renown

For those who prefer it, **"KWICKDRY" TOWELS** can be supplied in *flat interfolded packets* with semi-control cabinet

INEXPENSIVE — EFFICIENT

CONFORMS TO
1937 FACTORY ACT
OBLIGATIONS

Full details on application to Towel Dept.,
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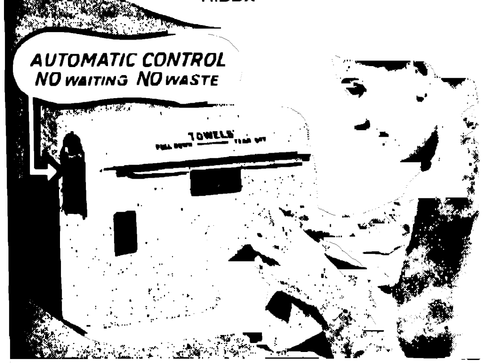

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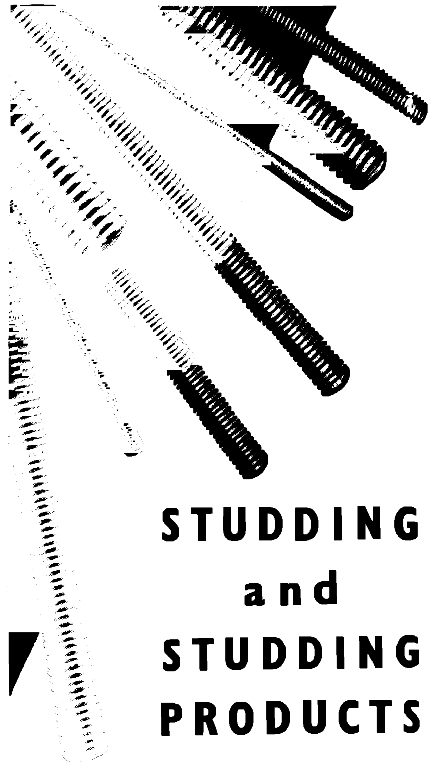
IMPROVED SUPER SOFT
PAPER TOWELS

Stand M 28 B.I.F., Olympia, May 3rd—14th



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All Diameters, All Lengths, All Metals in Whitworth, B.S.F., B.A., S.A.E., Metric and Special Threads.

Export orders accepted.

Large Stocks **PROMPT DELIVERIES**

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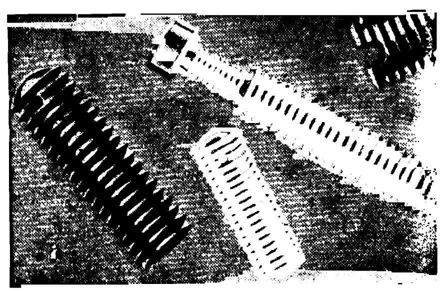
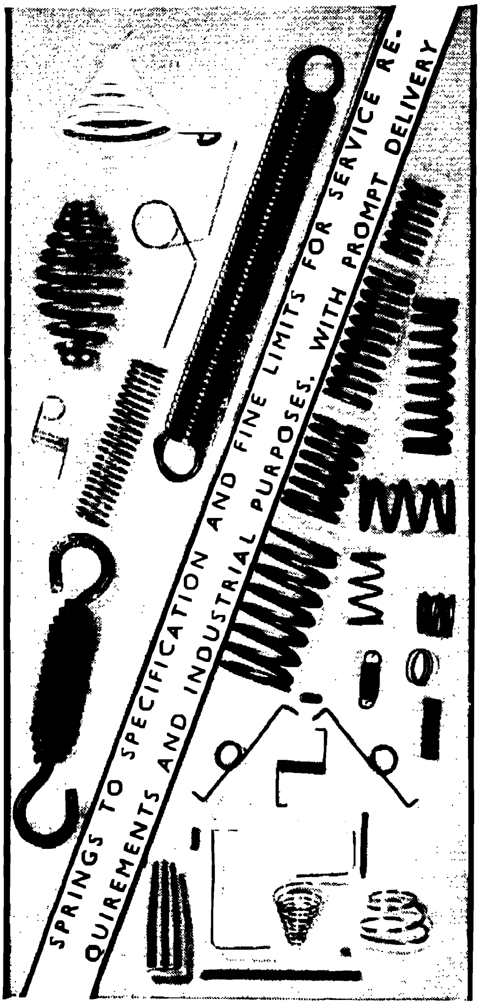


9311

TENSION AND COMPRESSION SPRINGS



LONDON SPRING

AND FIBRE COMPANY LTD.

FOREST MILLS,
282 FOREST ROAD,
WALTHAMSTOW · E·17

"There was no other press which would do just the job we wanted"

In need of a small press for producing small precision parts with a high degree of accuracy and a minimum of operator fatigue we designed the "STANELCO" Single-action Bench Toggle Press for use in our own factories. It is now being used by a vast number of satisfied customers. We can usually quote prompt delivery.

STANELCO

SINGLE ACTION

TOGGLE PRESS

LT Model
Weight 130lbs.
Max. Stroke 1 1/8"
Size of table 6" x 8"
Overall height 34"

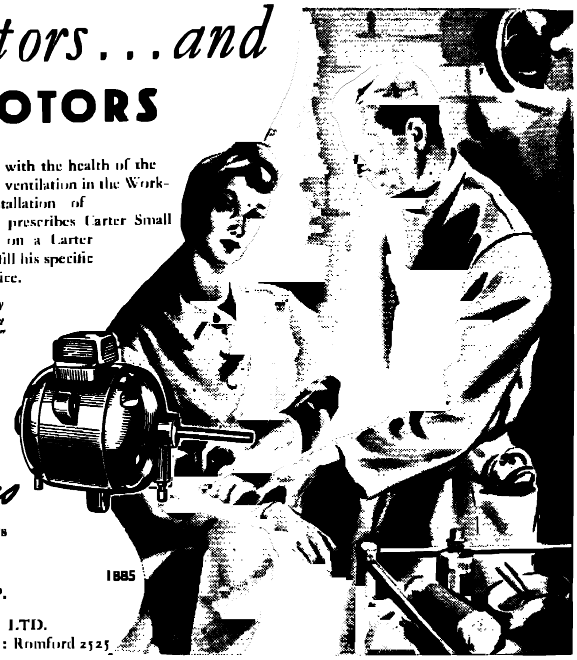
LM Model
Weight 80lbs.
Max. Stroke 1"
Size of table 7" x 5"
Overall height 23½"

Standard Telephones and Cables Limited

(Industrial Supplies Division)

Cline Road, Bounds Green, London, N.11

Factory Doctors . . . and
CARTER MOTORS



The Factory Medical Officer, primarily concerned with the health of the employees, understands the importance of efficient ventilation in the Workshops. He realises this necessitates the installation of efficient Electric Fan Motors. And the Doctor prescribes Carter Small Power Motors, because he knows he can rely on a Carter Exhaust Fan Motor . . . knows it was designed to fill his specific purpose . . . knows it was built to give lasting service.

THE EXHAUST FAN MOTOR. ***Totally enclosed motor with 3-lug fixing, ranging in speed from 1,400 r.p.m. with 9" fan blade to 900 r.p.m. with 24" fan blade.*** **100-440 volts, A.C.; 100-500** ***volts DC. Box type regulator supplied.***

CARTER
Purpose-built Motors

for Sewing Machines · Fans · Blowers
Grinding and Polishing Motors
Spur Gear Reduction Motors
Integral Worm Gear Motors
Standard Types of Motors up to 1 H.P.

1885

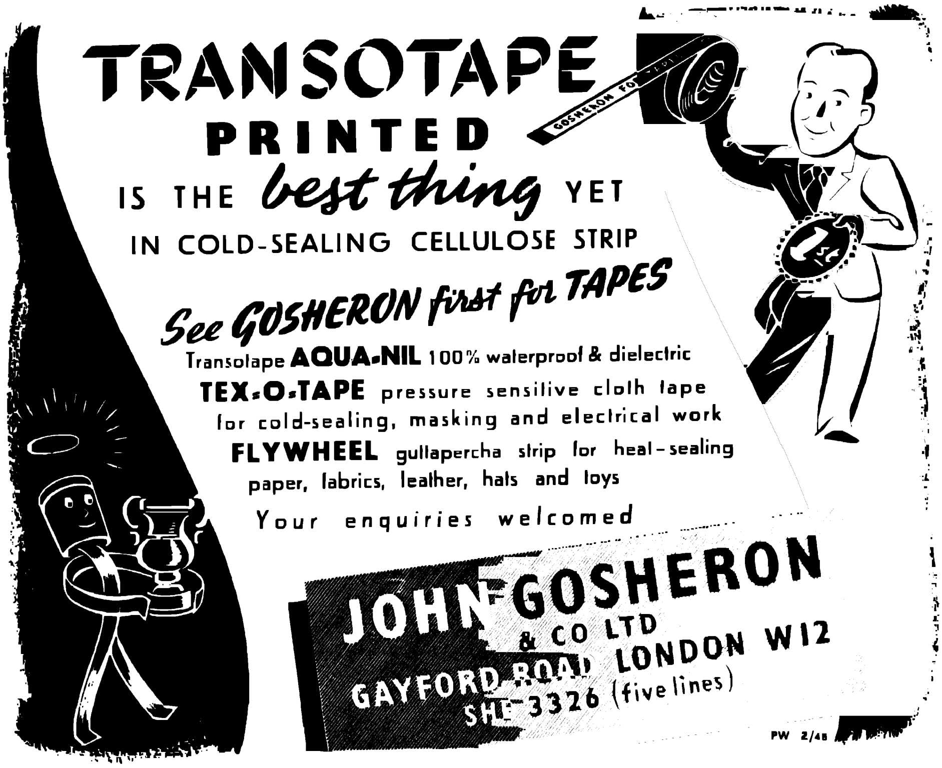
CARTER ELECTRICAL COMPANY LTD.
Eastern Works, Eastern Av., Romford, Essex. Tel.: Romford 2525

HEAYBERD
Go abroad!

In all parts of the world, from North to South and East to West Heayberd Equipment is giving trouble free service. Heayberd transformers battery chargers and rectifier units are designed and manufactured expressly to meet the conditions of the country where they are to be installed.

The specification of this part consignment of three-circuit Battery Chargers recently shipped to ALGIERS is as follows:—Model 63. Circuit 1. charges 24v at 1 amp. Circuit 2. charges 24v at 2 amps. Circuit 3. charges 24v at 5 amps.

F. C. HEAYBERD & CO. LTD
18, RUSSELL SQUARE, W.C.1.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IS THE best thing YET
IN COLD-SEALING CELLULOSE STRIP
See GOSHERON first for TAPES
Transotape AQUA-NIL 100% waterproof & dielectric
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for cold-sealing, masking and electrical work
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SHE 3326 (five lines)
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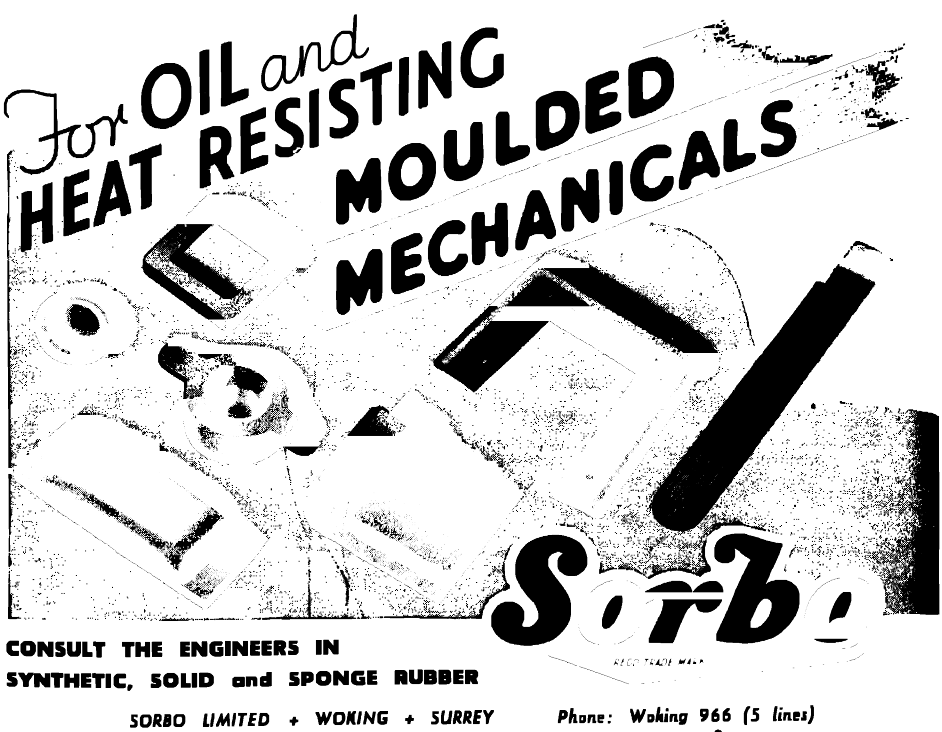
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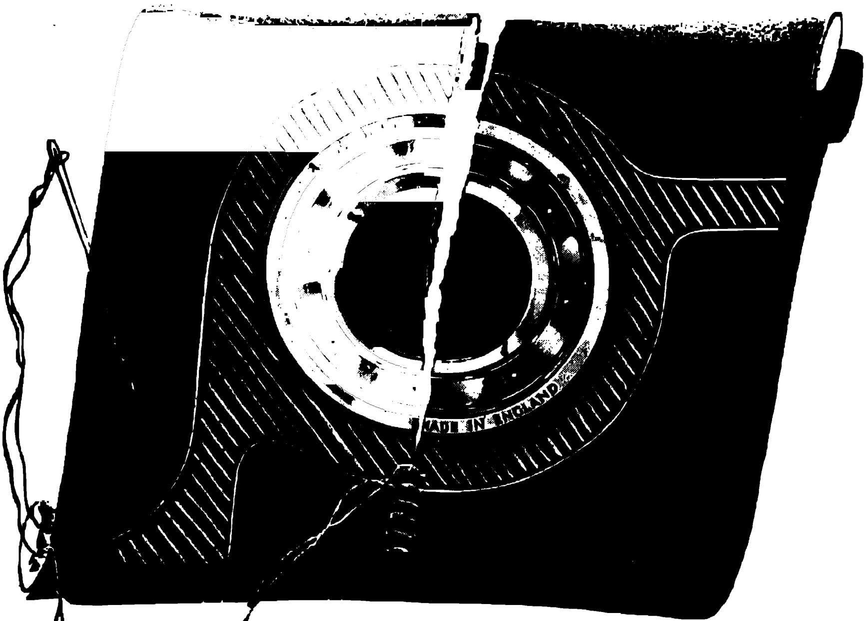
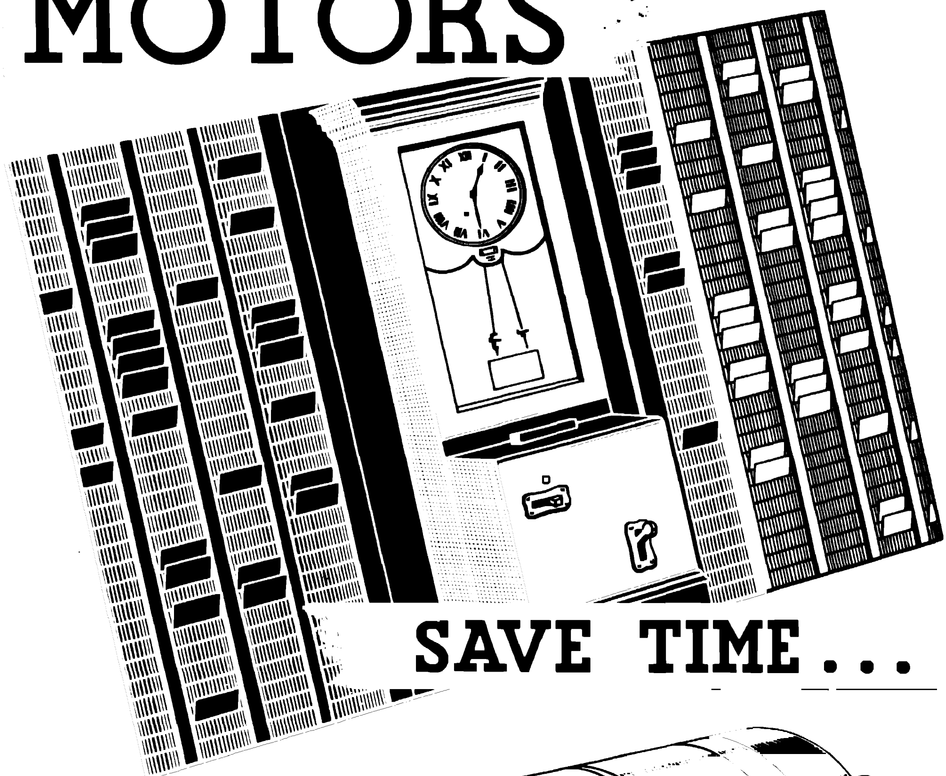
Note—If no page number is shewn, advertisements will be found in previous issues.

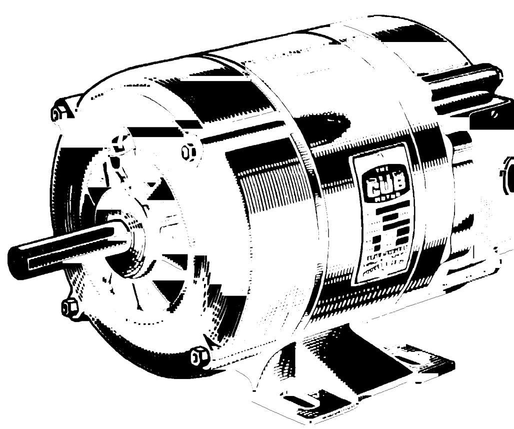
Avail yourself of new ideas and enquire for further details



MOTORS



SAVE TIME . . .

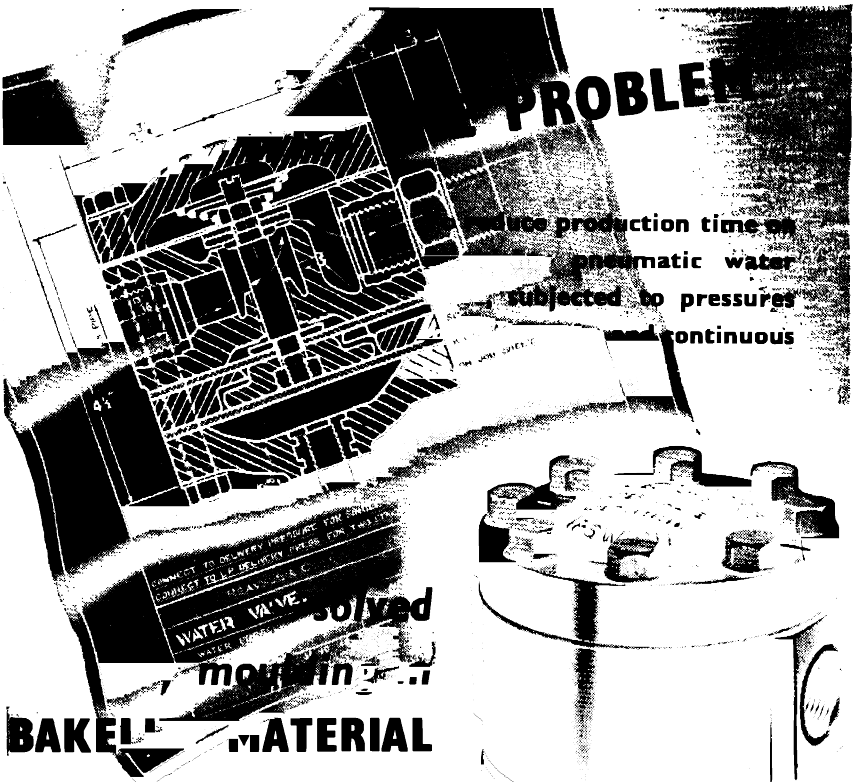


Instant power available at the touch of a switch, no standing time, negligible maintenance — motors eliminate power delay.

BROOK MOTORS LIMITED

EMPRESS WORKS • HUDDERSFIELD

H H. 46



The valve was previously built up from metal castings, the machining of which was a lengthy and skilled process. By moulding in BAKELITE material the 5 major components are now produced rapidly and accurately, complete with heavy metal feed pipe inserts. Some 3 days' machine work is eliminated, and ingenious mould design has secured interchangeability of parts, easier assembly, freedom from sticking and improved appearance.

The Reavell Valve was developed and produced as a moulding by Litholite Insulators and St. Albans Mouldings Ltd. Watford, for Reavell & Co. Ipswich, using a special water resistant grade of BAKELITE Material (X5283/3).

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for POWER with ECONOMY
– install a Ford Engine

If you use or manufacture cranes, air compressors, stone crushers, cement mixers or similar industrial equipment, Ford Engines can give you the power you need. Their simple design, strong construction and precision engineered parts will stand up to any work that comes along. Ford Engines range in power from 23 to 85 b.h.p. (there's also a special Petrol/P.V.O. 4-cylinder engine designed for particularly heavy duty) and the Ford Dealer Service, with Ford-trained mechanics, provides low-priced, Ford Service Facilities and genuine Ford parts. Manufacturers of Industrial Equipment are offered good delivery of these Ford Engines. Why not discuss your power problems with our Industrial Unit Department?

Ford

8 h.p., 10 h.p., 30 h.p.

ENGINE UNITS

FORD MOTOR COMPANY LIMITED, DAGENHAM, ESSEX

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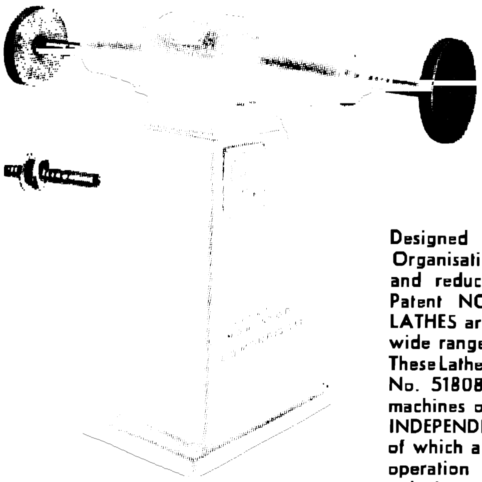
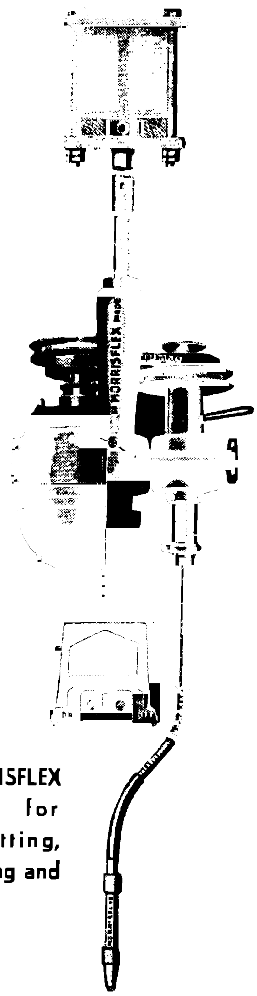
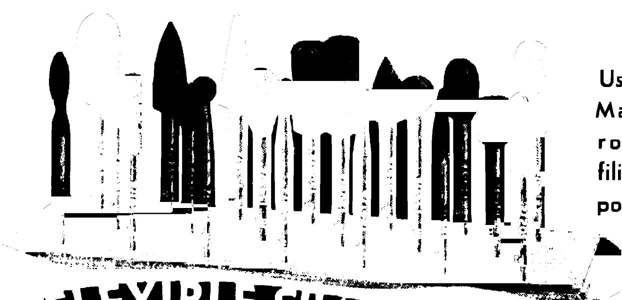
Cut manufacturing costs



Designed by the B. O. Morris Organisation to increase output and reduce costs, the MORRIS Patent NON-STOP POLISHING LATHES are proving a boon to a wide range of industries.
These Lathes are covered by patent No. 518083. They are the only machines of their kind fitted with INDEPENDENT SPINDLES, both of which are capable of separate operation as required, by individual push-button switches. Manufactured in 3, 4, and 6 h.p. range, and complete with standard false taper ends for polishing mops, bobs, etc. All types of replaceable adaptors for bobs, mops, fibre and wire brushes, grinding wheels, and collets for small shanked tools, etc., are available.



REX Rotary Cutters and Files are available in a large variety of shapes and sizes for every conceivable job.



Use MORRISFLEX Machines for rotary cutting, filing, grinding and polishing.

FLEXIBLE SHAFT EQUIPMENT

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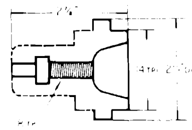
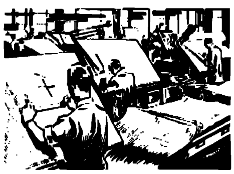
THIS IS THE Wickman WAY

Production UP... Change-over time DOWN *with Wickman's complete engineering service*



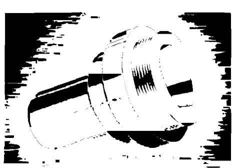
Your component drawing



Wickman's engineering service

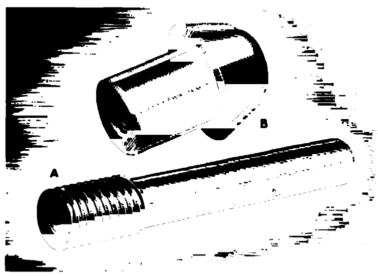
Wickman's demonstration bay

Your Wickman machine



the result . . . your component

YOU PRODUCE THEM



COMPONENT A	COMPONENT B
Screwed Spindle—Brass	*Pinion Blank—Mild Steel*
640 per hour	*320 per hour*

CHANGE-OVER TIME $2\frac{3}{4}$ HOURS

The 'Wickman Way' is realistically in tune with today's production needs: to produce *more*, in less *time* . . . to reduce *costs*, to ensure *accuracy*.

For instance, a problem of short-run production on automatics may be presented by change-over time wastage between runs. The example above shows what can be achieved on Wickman Multi-spindle Automatics. There are *no cams to change*. Time taken to change strokes for a maximum of 8 slides and bar feed is about 5 minutes. The unique Autosetting principles found only in Wickman Multi-spindle Automatics deserve your immediate investigation. Wickman's complete engineering service embraces your problem from the drawing to the machine.

A. C. WICKMAN LTD.
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Also makers of 'Wimet' Tungsten Carbide Tools of all types, and other specialised machinery and equipment

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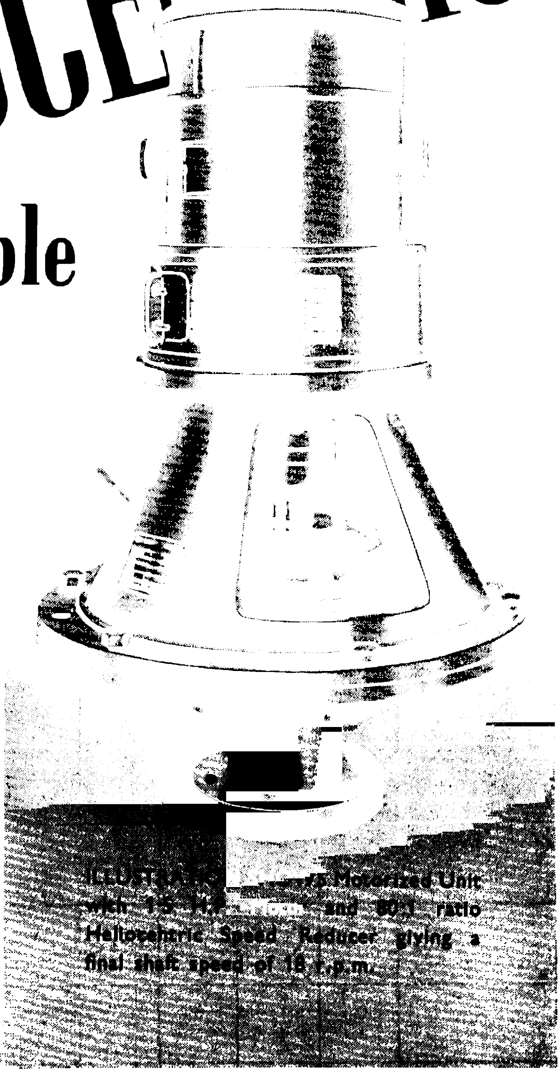
MAY 3-14 *See our Exhibit* STAND D416

by the HELIOCENTRIC principle



AVAILABLE STANDARD REDUCTION RATIOS
from
20 to 1 up to 6,400 to 1

Save space by installing a HELIOCENTRIC SPEED REDUCER combined with Electric Motor arranged for vertical mounting in one compact unit.

Can be supplied with Electric Motors or with specially designed flanged adapters to suit any make of motor. Horizontal Foot-mounted Units also supplied.

WRITE FOR LITERATURE

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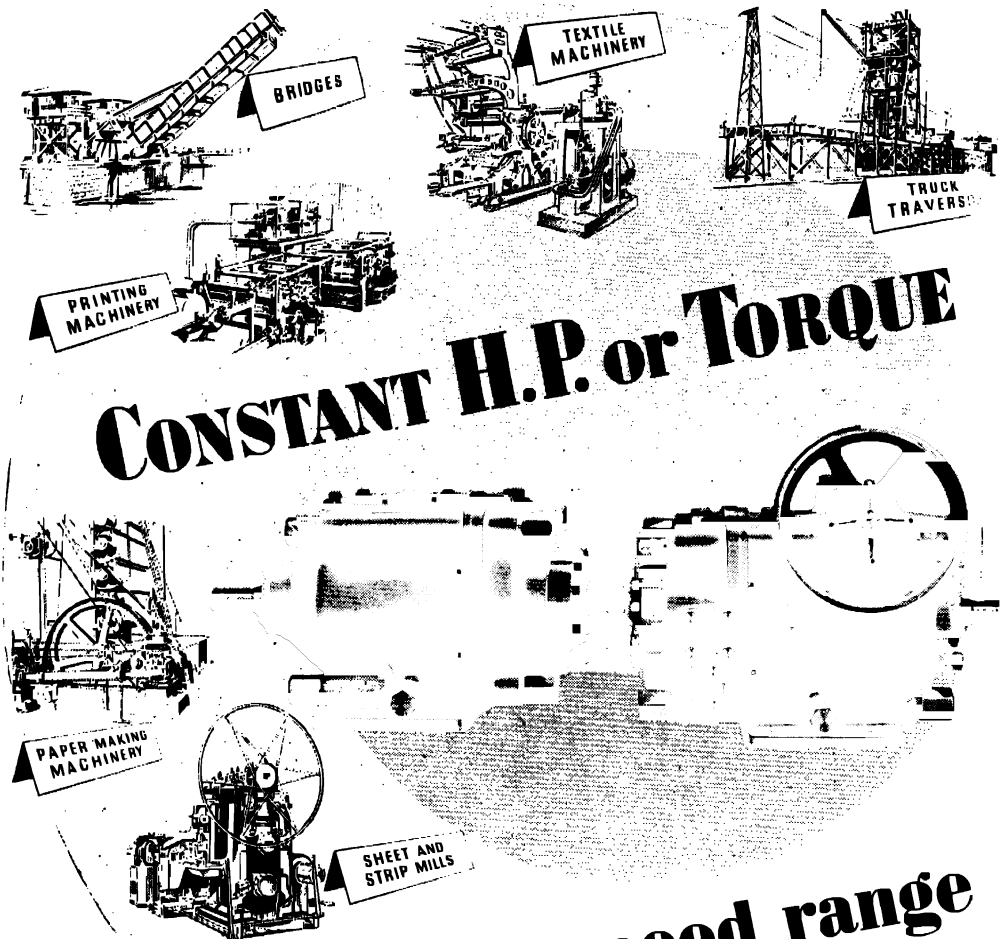

CONSTANT H.P. or TORQUE over a wide speed range

'VSG'

The VSG variable speed transmission gear is highly esteemed by leading engineers. The various advantages solve many transmission problems in a wide range of trades and industries. The chief advantages are :—

1. High torque at low speeds.
2. Quick yet SMOOTH acceleration combined with perfect control in either direction.
3. Ability to "inch" and rotate at very low speeds.

Hand wheel, lever or screw controls can be fitted to suit individual requirements. *Write for full particulars.*

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VICKERS-ARMSTRONGS LTD.

HYDRAULIC INFINITELY VARIABLE SPEED TRANSMISSION

SOLE AGENTS IN THE U.K.
FOR ALL INDUSTRIAL APPLICATIONS

ROCKWELL
MACHINE TOOL CO. LTD.

SECOND WAY, EXHIBITION GROUNDS, WEMBLEY, MIDDX. *Phone:* WEMBLEY 5[illegible]

VSGD2

The nearer the approach to the Ideal, the greater the appreciation of Individuality.

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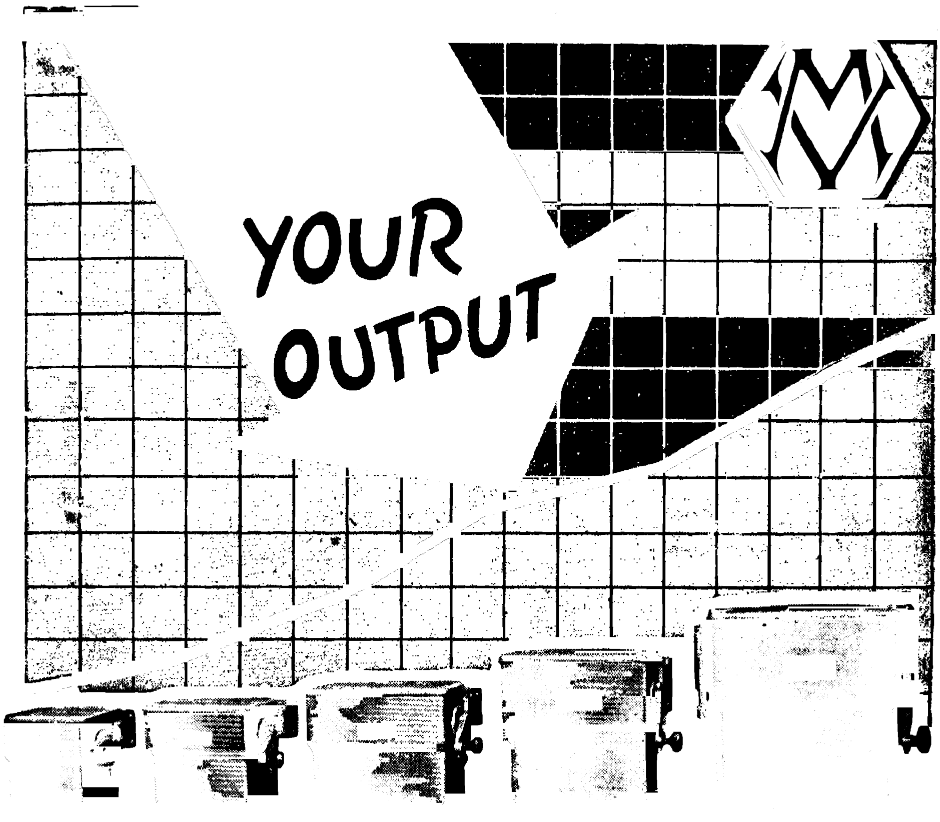
Blackheath Dropforging Service has proved, and continues to do so, that Individuality of Purpose in doing things BETTER still, stands silhouetted against massed mediocrity.

SUPERIOR DROPFORGINGS

...H STAMPING CO. LIMITED

...CKHEATH · BIRMINGHAM



25 Amp. 40 Amp. 75 Amp. 125 Amp. 250 Amp.

METROVICK OIL-BREAK SWITCH STARTERS

Instal Metrovick oil-break switch-starters for Squirrel-cage Motor applications.

Up to 200 hp., up to 650 volts.

Types : OSD Star-Delta
OSP Series-parallel
OD Direct-on

These starters can be supplied with ammeter, floor stand and various types of cable fittings, and, except for the smallest size, can be fitted with an interlocked isolator and arranged for multi-panel board assembly.

May we send you Descriptive Leaflets?

METROPOLITAN Vickers

ELECTRICAL CO., LTD.
TRAFFORD PARK ··· MANCHESTER 17.

H/A601

Switch to METROVICK Lighting when daylight fades

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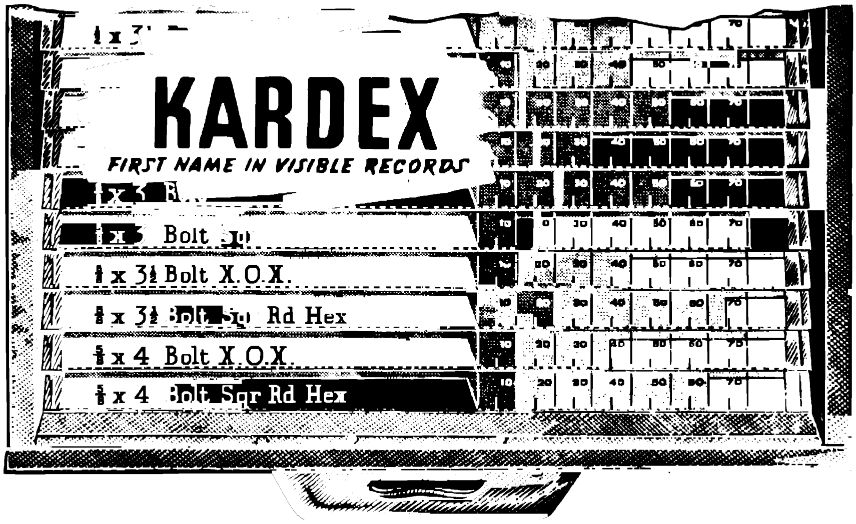

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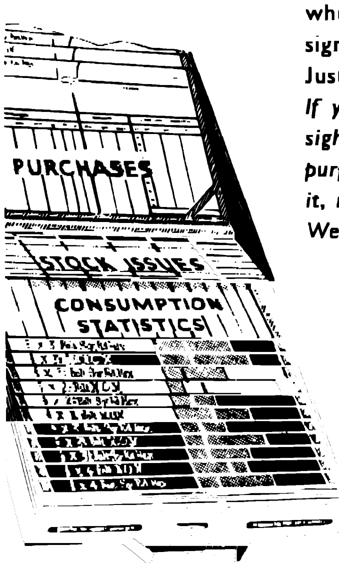

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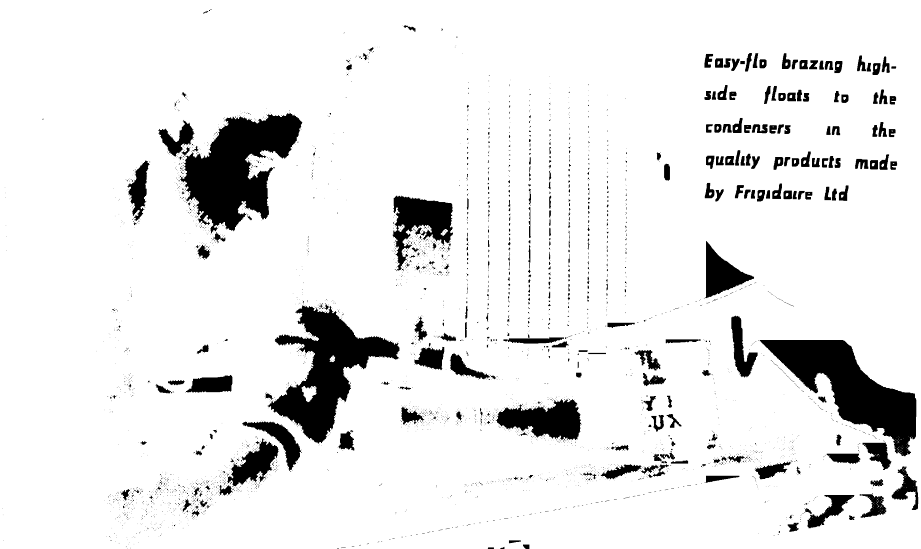

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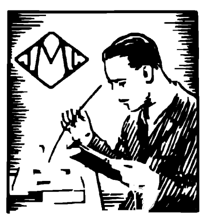

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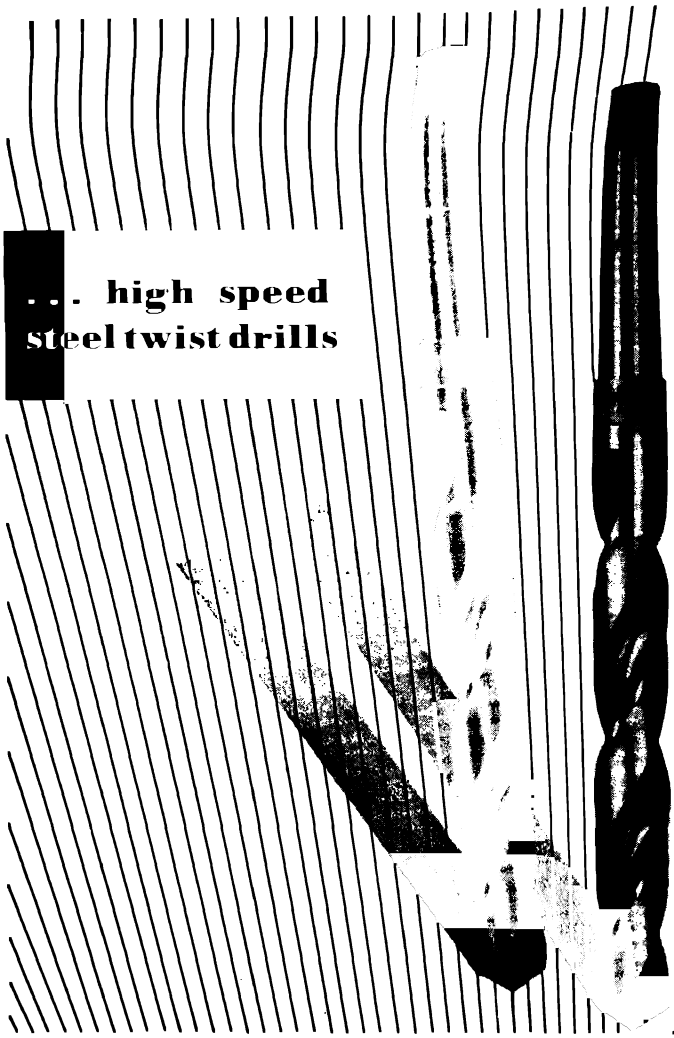

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GOVERNMENT AND INDUSTRIAL POLICY

THAT it is easy to criticise is a well known and accepted fact. Another accepted fact is that it is quite " right and proper " to criticise the Government. Sometimes this criticism is deserved, sometimes not; either way the Government certainly gets its share. The five-day debate on the Budget and the Economic Survey held early last month was no exception to this rule. In this case it was Government planning that was criticised and on three main counts; that there exists no reliable way of ensuring that decisions are carried out, that the decisions themselves have frequently been based on serious errors of forecasting, and that the policies decided upon seldom make the best use of available national resources.

This last criticism was particularly emphasized a few days ago by Sir Frederick Bain, president of the Federation of British Industries, when he addressed the members on the occasion of the Annual General Meeting. During the course of his speech Sir Frederick spoke of the need to re-equip Industry to meet the demands that would be made upon it in the future.

"Our main job in Industry is to get our old plants replaced; to improve our efficiency and to exploit our new inventions and discoveries," he said, " There is not one of us who has not felt frustrated in attempting to achieve these things. Capital equipment and machinery has been one of our most valuable exports, but the industry of this country has gone short. For a short-term policy that was justified. To-day, our policy must be a long-term one, and the period of aid from America must be used primarily for the rehabilitation of our own industry. The Government must adapt its export policy, Industry must be allowed to arm itself to meet the competition of the world. We must get down to true costs as speedily as possible."

Sir Frederick also emphasised in his speech, the need for " a system by which Industry might voluntarily adopt its own methods to carry out Government proposals." In support of his plea for such a system he asked his audience to consider our experience since the war. He pointed out that to ensure the correct use of materials, we have systems of licensing. To deal with evasion created by the licensing restrictions, we have " authorities to manufacture." To force the manufactured goods on to export markets we have purchase tax that restricts home demand and licensing systems tied to export sales for the same reason. We have price controls to keep prices down;

but they have in some cases kept prices up, because of the way they encourag... in-efficiency. So price control leads in turn to high profits by the efficient, and to count...r this we have profits tax.

Each new problem has been met by fresh statutory restrictions, leading to still more restrictions to stop up the leaks disclosed by the first, and to grapple with the evasions set in motion by the wall of restriction. This last point is perhaps the most serious of all—that if all our affairs are to be controlled by statute, we shall encourage a world of black markets, of evasion, of law breaking, the very antithesis of the unity of objective which is the purpose of the controls themselves. Thus could the moral fibre of the nation be damaged.

In the debate in the Commons, Mr. Harold Wilson, speaking for the Government, seemed scarcely to recognize that the difficulty in getting "complicated private industry to fit in with the proposals of the Government" may well arise from faults and pretensions in the proposals themselves, and not from any outside resistance. Past mistakes have been admitted. The Economic Survey for 1948 recounted the misjudgments of the Survey for 1947, and showed the gap between the plans laid down and the results. The dollar drain was grossly underestimated and the export targets were not reached.

Towards the middle of last month, a revision of export targets became necessary. The reason for this was that the original targets had been fixed without consideration of the supply position of certain raw materials. Again, in another field of planning, we have the case of the groundnuts scheme. It is now estimated that the cost of the African groundnuts scheme will be about £50,000,000 instead of the original estimate of £25,000,000, an error of judgement of the order of 100%. The Government claim indulgence for these blunders in estimating because of the "size of the job" but one cannot help wondering how much credence would be given to such an excuse if it were put forward by a private firm !

Four Things Essential to Our Existence

Nobody, least of all the industrialist, quarrels with the broad outlines of the Government's aims. They are dictated by circumstances and are correct in principle ; any Government would adopt similar aims. We *must* sell more in dollar areas, we *must* balance our overseas accounts, we *must* increase industrial efficiency and we *must* try to increase world trade. The foregoing are essential to our existence ; it is with the detail that we are concerned, the methods of carrying this policy into effect.

The main criticism we have of Government planning is that too little is being done to re-equip our industries and build up new industries so as to ensure support against the strong competition we expect in the future or, alternatively, to assist the country in cutting down imports. Sir Stafford Cripps has acknowledged the need for re-equipment on more than one occasion but the record of the present Government is far from reassuring. The usual excuses put forward, those of shortage of steel and the need to export, are wearing a bit thin now and the argument that steel will not be available for home use cannot be right if it prejudices exports in two or three years time.

We realise that for a period, at any rate, there may have to be a general overall direction of our economy laid down by Government after consultation with Industry. We believe that Government must state clearly the main lines of its industrial and financial policy and indicate to the various sections of Industry the results they are expected to produce and the degree of re-equipment they may anticipate. But we believe finally, that there must be developed, as Sir Frederick Bain suggested, a system by which Industry may adopt voluntarily and in consultation with Government, its own methods to carry out that policy, so that it may substitute flexible methods for the rigid strait-jacket of the statutory control.

Current co[illegible]ng industry

TRENDS

BRITAIN continues to wage a grim [illegible] existence and the combination of recent events has taken within its amb[illegible] practical accomplishment of the price-freezing edicts of the Board of Trade, the egalitarian aspirations of the F.B.I.'s voluntary ceiling on dividends and their agreement to stabilise or even reduce prices at the expense of profits.

The pattern of our economy is thus being fashioned, and one can take either a hopeful or a gloomy view of developments. Cheerful oracles regarding the outlook are put forward by some State Ministers, flanked by woeful tales by others. Whichever is right, the pros and cons seem to be fairly balanced.

Our budget, which was the *piece de résistance,* did not contain chastisement with scorpions, as some people thought it would. Our Chancellor is not entirely a Socialist idealist like his predecessor and knows that the more reward industry gets for its efforts, the harder it will work and the more it will produce.

In the International sphere the solidarity of purpose and identity of interests have been demonstrated by the Western Union pact, the economic clauses of which tie up with the sixteen Nations European Recovery Plan worked out in Paris and the charter for permanent organisation, which will supervise American economic help—the Marshall Plan. This is now *un fait accompli,* and promises to change the situation sufficiently to avert further cuts in imports of raw materials from the Western Hemisphere. We do not intend to use it, however, as an anodyne, as we did the Washington credit, nor as a temporary expedient but as a revivication of the whole Western European economy, and there seems to be no other means apparent whereby this can be brought about.

Simultaneously with the spate of emigrants mainly to South Africa and Australia, there is a movement on the part of many manufacturing and industrial enterprises to stake a claim in the young and growing communities of the Union and the Commonwealth.

Some industrialists look askance at the policy of British firms opening up manufacturing operations elsewhere in the Empire, arguing that it is creating competition with our own industries and must unfavourably limit our overseas markets. This does not naturally follow and in any case it is a myopic view-point.

Engineering firms are represented amongst emigrants ; they are blazing the trail and finding plenty of attraction " down under." They appear to be satisfied that there are solid commercial advantages to be attained, given the necessary raw materials, power, water supply and labour. It is argued that a variety of goods can be fabricated more economically in more congenial climes than in the mother country.

The Government's Colonial development scheme has created the urge for overseas manufacturing expansion and any foreboding fear that this is likely to restrict our own trade need not be allowed to germinate. It can be set at rest when it is recalled that in the early days, when we were regarded as " the workshop of the world," Germany's industrial emancipation evoked misgivings and perturbation. Yet the flow of trade between the two countries multiplied beyond all recognition compared with that of the Bismarckian era. Expansion of industrial power in countries of the British Commonwealth would probably have a similar stimulating effect.

Science in Industry : Higher Efficiency

Those inured to the technique of industry and the science of factory management are well aware that the human problems are as complex as are the physical. The viewpoint of the worker and industrial psychology are matters as old as the hills—and not a recent discovery as might have been thought when a Minister of the Crown recently contended that No. 1 problem in industry was how to encourage and assist the human being to give all that he is eager to give if rightly inspired.

Cabinet Ministers can hardly be admitted to give effective doses of advice to industrialists ; and consequently a recent speech has been criticised as it postulated that production could be raised by a revolution in managerial attitude and methods and if workers were rightly led and inspired.

Quite a number of industrial undertakings have announced spectacular increases in output as a result of applying more logic to their layout and flow of work. A leading Tube Company has reported startling increases in output per machine-hour as a result of introducing the latest scientific methods whereby human effort is minimised and all waste time and energy eliminated.

A contributory cause to low productivity has been traced to non-productive man-power—men kept for chasing jobs and materials, supervising inexperienced labour, breaking bottlenecks and the misuse of time and motion study. Staffs likewise have to be kept for official form filling, statistics, personal affairs, P.A.Y.E. etc. In many cases Trade Union practices are a serious stumbling block to progress.

Our unrivalled trade and industrial eminence is dependent on the harnessing of technical and social science to British skill.

News and views of men who lead

QUOTING the

The deadweight of bureaucracy

MR. C. PATRICK CROSSLEY, Chairman of John Crossley & Sons, Limited:

It is customary for the chairman to make some reference to future prospects, but I do this only with the greatest diffidence in existing circumstances. While I am convinced that this company is in as sound a position as any in the industry, both to serve the community and to provide a reasonable return to the stockholders, I cannot view the future with any great amount of optimism.

The paralysing hand of bureaucracy is creeping deeper into industry, and I am convinced that until this trend is reversed and greater scope allowed to those whose life work has been the efficient management of industry and commerce there can be nothing but a steady decline in our standard of living. The vast numbers now unproductively employed in national and local government service have to be supported by those in productive industry.

Until an improvement in the ratio of productive to non-productive workers takes place, I cannot see how we can have sufficient manufactured goods to send abroad to pay for essential imports of food and raw materials, and at the same time provide the home market with sufficient goods to improve our standard of living.

Need for Wages—Production link

HON. RUPERT E. BECKETT, Chairman of Westminster Bank Limited:

In the task of employing our limited resources to the best advantage, we are constantly hampered by another difficulty which, though less obvious, is none the less dangerous. I refer to inflation. There is a lack of proper relationship between the money people have to spend and the quantity of consumer goods which the nation can afford to put at their disposal after meeting the needs of the export drive. The result is a surplus of spending power which draws resources away from the vital industries and trades. Despite all controls, labour and materials are frittered away in unnecessary or useless pursuits.

A greater danger still is a wages and cost-of-living spiral. Inflation breeds upon itself. In its acute form such a development could bring all our efforts to nought. It is most important that this problem should be resolutely tackled before it gets out of hand, for the prospect before us is of still fewer goods in the shops for some time to come. Neither in the April Budget not in the autumn supplementary Budget was this issue faced.

Almost every country is grappling with this problem. Only one, Russia, claims to have solved it. She has adopted an expedient under which the pursuer of goods is deprived of the ammunition by means of which he may bring down his quarry—in other words, a wholesale confiscation of the monetary resources of the people. I am certain that such a course, if proposed here, would be regarded as far from a fair deal to those who have been ceaselessly exhorted to save.

Wages, which play so important a part in determining production costs, must not be allowed to increase without reference to output. Wage rates at the end of 1947 were 73 per cent. above the pre-war level; earnings have risen even more. The wage-earning classes have been treated more liberally in this respect than the rest of the community. Further increases in wages unaccompanied by a commensurate increase in output merely add to the dangers of inflation. The advantage to the wage-earner is illusory, and the effect on the national economy positively harmful.

Controls are a burden on costs

MR. DOUGLAS HAMILTON, Chairman of William Hollins and Company, Limited:

The maintenance of wartime controls and the swollen ranks of the Civil Services are a burden on industrial costs, difficult enough to bear in a sellers' market, but which will become intolerable when our former trade competitors once again enter the field, the sooner a cut is made the better, both for the Services and for the country.

Private enterprise lends a hand

MR. C. J. F. SAVILL, M.I.B.E., Chairman of Hampton Timber Company Limited:

During the past 12 months I have travelled abroad to renew contacts with pre-war shippers, and I am pleased to say that the Government have now realized the abilities of the timber trade to secure that which the country requires—timber; recognising that private enterprise is essential to success, they have agreed to allow established timber agents and importers such as your company to negotiate the purchase and import direct of hard woods, obviously recognizing the fact that it requires a specialist to do a specialist's job, in which category I claim our company stands.

Chairman

There is a danger; we are handicapped by the high costs and lack of freedom in production in comparison to foreign competitors and we find several countries are almost closed to British goods, while in other countries where British goods are sold too cheaply, the currencies of those countries are too high a value in comparison with sterling.

Industry compelled to cynicism

MR. C. BASIL NIXON, Chairman of Leyland Motors, Limited:

The world situation is still as complex, difficult and unhappy as a year ago, and little, if any, real progress can be recorded. On the one hand, we have U.S.S.R. in foreign policy still the old Russia, secretive, subtle, acquisitive, and non-co-operative, and on the other, the United States, immature in international affairs, commercially aggressive, fiercely competitive, and in fear of Communism, but otherwise well intentioned and generous.

Ours is not a sheltered industry; it is dependent on favourable world economic conditions for success. There are many international reports and plans for the future, as yet unratified, to the making of which much time, money, thought, and good intentions have been devoted; at home a mass of untried doctrinaire legislation has been hastily enacted, the work of an enthusiastic but inexperienced Ministry.

What the results will be we cannot tell. So many nostrums and amateurish proposals, which have subsequently failed in their purpose, have been made that industrial realists have become somewhat cynical. The difficulty of finding supermen to manage the vast Government trading undertakings is already becoming apparent, as also are the losses.

If industrial management makes a mistake the shareholders pay, and no one else cares; now the already overburdened taxpayer is being called upon to make good the Governmental deficiencies.

No publicity for state trading

MR. H. C. HENLEY, Chairman and Managing Director of Henlys Limited:

When Parliament first admitted State trading it took care that its Public Accounts Committee should have a full progress report with a careful examination and report on accounts by the staff of the Comptroller and Auditor-General.

This is now omitted on the ground that these boards are really in the nature of commercial undertakings and must not suffer detailed control. Presumably their organisms are too delicate for the wind of inquiring publicity. Will occasional directives from the Ministry concerned be the sole control? Will these directives be sufficient to secure efficiency and to prevent waste?

It has been claimed that effective control really does rest with Parliament in the long issue because the Minister controls the Board and a debate can always be had. This may be good enough for a text-book, but in Parliamentary practice it simply does not work out.

Such a debate, if held, would be useless because its basis would inevitably become a question of political confidence in the Minister instead of being, as it should be, a searching economic inquiry founded on evidence. Nor are we happy over the relationship of Area Boards to the Central Authority. The Area Boards must work through their officials, and these are bound in the long run, as a junior part of the hierarchy, to take their orders from the Cabinet of senior officials sitting centrally.

Is there not a danger that the Central Authority will gradually collect to itself all real power and so come to regard the areas as simple units of its own administration? What then becomes of local considerations?

Industry's life-blood drained by tax

LORD HOWARD OF GLOSSOP, Chairman of the Guardian Investment Trust Company Limited:

There is another matter which may have a great deal of influence on companies' profits. I refer to the Profits Tax, now doubled and made retrospective. One can perfectly well understand the necessity of such taxes as E.P.T. and N.D.C. when the country is at war, but now that war is over and we are planning for peace it surely is the height of folly to replace these war taxes by another which really does the same thing under another name. Why should the profit motive which is the life-blood of industry be curbed in this way?

I view this Profits Tax with the greatest misgiving. Its rate can be changed by a stroke of the pen and its effects can no longer be determined when such innovations as retrospective taxes are the order of the day. It is for these reasons that we cannot make any really accurate forecast of what our holdings in Ordinary stock will bring in during the current year. The estimate we have made, however, gives some grounds for hoping there will not be a severe diminution in income.

One of Britain's best dollar earners.

The great pottery producing centre of Britain is at Stoke-on-Trent, a city of six towns—Stoke, Burslem, Longton, Hanley, Fenton and Tunstall. About 300 potteries of all sizes are working in the area, almost all of them sending the major proportion of their output overseas. The larger firms employ up to about 2,000 workpeople and staff, but quite a number have fewer than 100 on the payroll. Some of the firms are very old established, dating back to the beginnings of the 18th century. Indeed, Stoke itself has developed around the original works founded in 1759 by Josiah Wedgwood, father of the pottery industry.

90 per cent. export.

Mechanisation has taken over certain of the manufacturing processes, and many potteries have been extended or rebuilt to accommodate the machinery and equipment required in mechanical processing, but, conversely, as this side of the industry has developed, so has the demand for the skilled craftsman and artist in pottery. In addition to the actual production of ceramics, ancillary industries include those making stains, glazes, oxides, and colours employed in decoration, as well as others producing the plant and packing materials needed to transport such fragile goods as china and earthenware.

Obviously, it is impossible to notice more than a few firms representative of the industry, and that of Josiah Wedgwood & Sons, Ltd., located at Barlaston, Stoke-on-Trent, is typical of the most advanced firms in this business. About 12 years ago the historic pottery at Etruria was vacated in order to build a new factory on the most modern lines in an area where there is ample room for extension, and the air is clean.

Three-quarters of the firm's total products by value is going overseas. In the case of pottery the figure is about 90 per cent., since the sale of "seconds" and slightly faulty goods is included in the total, and these are—to a very large extent—sold in this country.

Wedgwood exports to the United States comprise more than one-half of their total overseas sales, equivalent to one penny in the pound of all British exports to the United States. So heavy is the demand in that country for the products of this historic firm that no orders have been accepted from there since the end of 1945 on account of the large

Pottery Production

Our Midlands correspondent, Mr. W. L. CARTER has been investigating the production of pottery for export and his report, together with photographs of some of the principal products that we are exporting in quantity to many countries, is given in the following pages.

volume received previous to that date. It is anticipated that most of these orders will have been completed in the early part of 1949, when the American order book will be reopened.

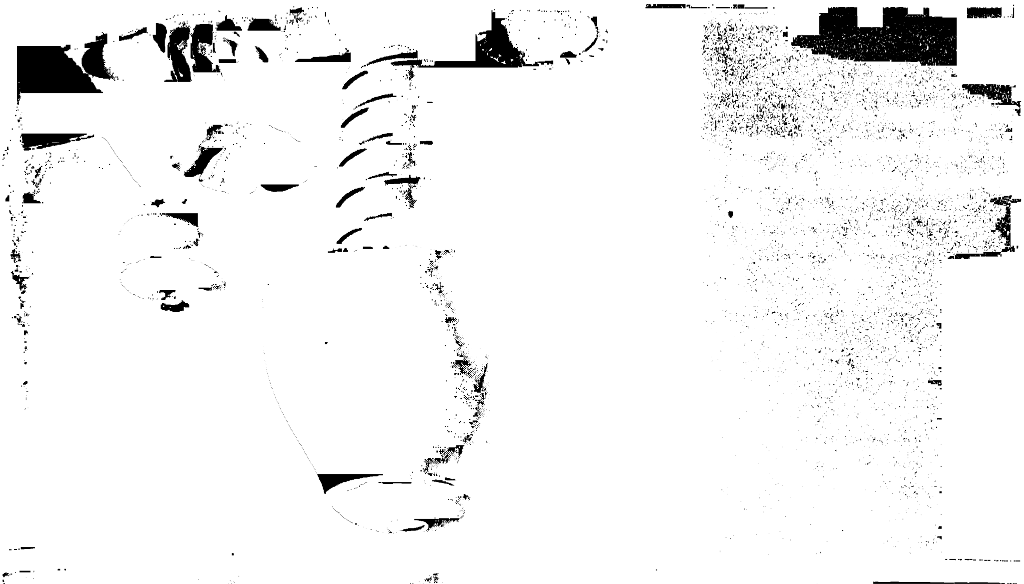
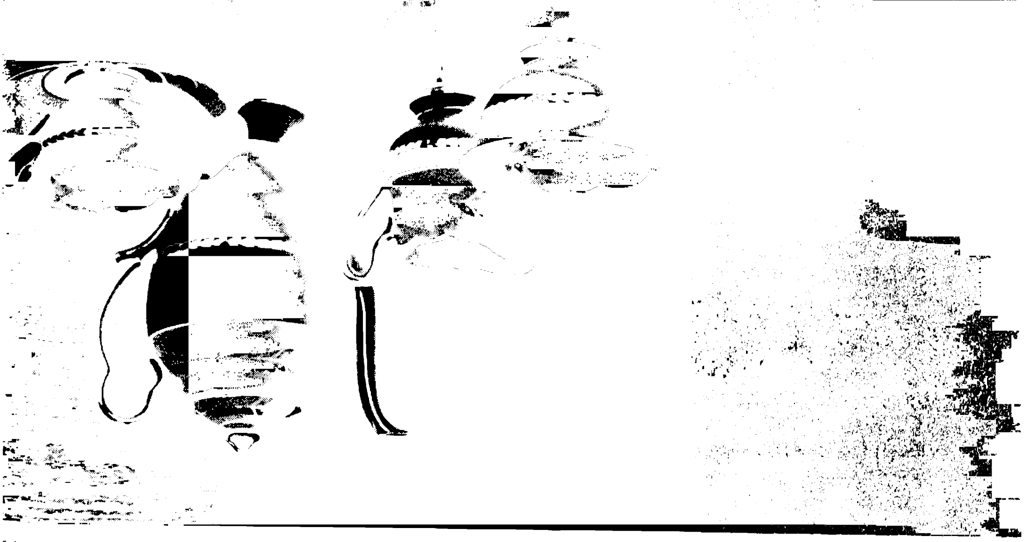
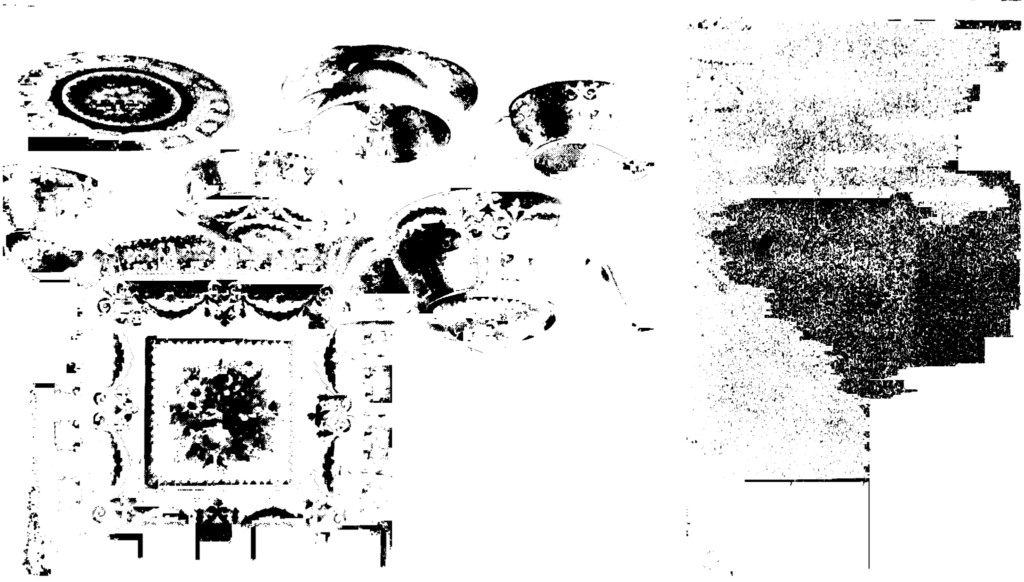
In common with many of the principal pottery making concerns of the district the firm suffers from a serious shortage of operatives, especially skilled and semi-skilled women decorators. If this additional labour could be obtained, Wedgwood's export total to exclusively "hard currency" countries could be almost immediately increased by 15 per cent. Nevertheless, despite quotas and restrictions in certain world markets, the wartime reduction in the large number of patterns formerly made and the erection of an entirely modern pottery has resulted in an increase in output volume since 1939 of about 40 per cent. per operative employed.

Manufacturing methods

The manufacturing process described below in detail is that used by Wedgwood's in producing fine earthenware, but the method by which bone china is made bears close resemblance, except that it is more complicated, with, of course, higher production costs.

In the sliphouse ball, and china clays are mixed separately with water in a machine called a "blunger," which is fitted with rotating blades to mix the liquid thoroughly to a pre-determined consistency. China stone and flints are milled to an advanced degree of fineness. Each material is then transferred to a separate "ark" for storage, and kept constantly agitated to maintain consistency. The correct proportion of each ingredient used—the exact amounts are naturally those of the pottery's own formula—is then pumped into a measuring tank, and checked by both volume gauge and scales in order to arrive at the correct specific gravity before being run into the blending ark, where the liquids and solids, now termed slip, are thoroughly blended.

The slip is then passed through three fine sieves and over an electro-magnet to extract any ferrous particles in suspension. The product is then forced under pressure into a filter press. Water passes out, leaving thin square slabs of plastic clay of about 1 cwt. each. The clay is not yet sufficiently prepared for working by the potter, as it contains fine air bubbles. These are removed by processing

Here we see a plate in the making at the Royal Doulton Potteries. A certain amount of mechanisation has inevitably crept into what was, at one time, purely a hand oper ation. Th [illegible] ng to [illegible] is giving [illegible] d [illegible] the

in a pug mill, where a technique resembling that of an immense mincing machine converts the clay into a smooth homogenous mass, which is then extruded in an endless roll. This product is then cut off into lengths suitable for easy handling.

Next comes in the designer, and from his studio drawings of new shapes, etc., go to the modelling shop where clay models are made. These are fashioned in what is called "clay size," which is larger than that of the finished article. Moulds of plaster of Paris are made from the clay model, and reproductions from the moulds shrink to "dry clay" size, and again when fired. This is an extremely delicate part of the process of manufacture as meticulous accuracy in allowances for contraction must be made, demanding an exceptionally high degree of skill. From the plaster of Paris moulds are made the actual potter's moulds. The various parts of the moulds must be an exact fit, as bad joins leave raised seams on the ware. Notches in one part of the mould lock with hollowed recesses of other parts, thus making a correct fit. Where articles like plates or cups are made the moulds are designed to fit the head of the potter's machine.

Plates are produced on a machine termed a "jigger." A clay ball is flattened on a revolving disc by lowering an automatic spreader. The resulting "bat" is then "thrown" by the the operator on a plaster mould which shapes the front of the plate, followed by the high speed rotation of the mould. The back of the plate is shaped by a horizontal metal profile operated by the plate maker's left hand, leaving his right hand free to work the clay. Cups are made on a machine called a "jolley." The setting of a lever-operated profile regulates the thickness of the cup as well as forming a correctly fashioned interior.

Pottery throwing is one of the most ancient crafts. Indeed, apart from the pedal controlled, electrically driven wheel, the method is precisely similar to that employed centuries ago. While there is no limit to the variety of shapes that can be produced by the thrower, it is, of course, a far more expensive process than either casting or jolleying.

The clay pieces dried to a consistency

Character jug painting at the Royal Doulton Pottery works. An example of hand finished work.

termed " cheese hard " pass to the turner who, using a small lathe, shaves off or turns surplus clay to the required dimensions. Beads or fillets are added by imprinting with a tool called a " runner " on to the rotating pieces. By reversing the motion of the lathe and using a smooth steel tool the surface is burnished.

Casting is done by an operator pouring slip into a plaster mould which absorbs the water from the slip. The thickness of the coating depends upon the time the slip remains in the mould. Handles are made from mould pressings, or from clay cut and shaped by hand from long strips. Embossed or hand-made clay bas reliefs are applied by the ornamenter, and fixed by the sensitive hand of the craftsman. This last method is that actually in use 200 years ago.

The first firing

When the clay piece is " white hard," i.e. dry and chalky in appearance, it receives a first firing in what is termed the " biscuit " oven. The old type saggars, a kind of massive protective firebox, are dispensed with at the new Wedgwood factory, where electrically heated tunnel ovens have been installed, the first of their kind in England. Flat articles such as plates are embedded in layers of sand. Other items are placed in tiers of refractory fireclay bats on oven trucks. Trains of 50 trucks pass slowly in opposite directions through tunnels of 273 feet in length. The maximum temperature for biscuit firing exceeds 1,200 degrees Centigrade, and 1,160 for the later glost firing. The glost firing is carried out when the biscuit ware, which is hard and durable l ut porous, has received its pattern or has been painted or hand-enamelled, and dipped into liquid glaze, then dried and cleaned. In the glost oven no contact is permitted between articles, which are kept separate by fireclay supports, or they would be fused together by the glaze that vitrifies at the high temperature used.

Application of patterns

Standard patterns of china or earthenware are hand applied by means of transfers engraved on either a flat copper plate or cylinder, and printed on a power operated machine. Cylindrical patterns are printed on continuous rolls by colour mixed with oil fed to the electricall heated cylinder. All superfluous tissue paper is removed and the paper print applied by the transferrer. After applying by a flannel rubbing on the ware, and then with a hard brush, the paper is washed off, leaving the pattern. The article is then passed through an electric kiln to harden the colour of the printed design or pattern, when used on biscuit ware, or to fuse the colour to the glaze where printed. Enamelling on glaze, a colour range of almost unlimited scope, is done by hand, as also is painting, the latter products being high-priced and in keen demand by " hard currency " countries. Not only does hand painting require high artistic ability, bu also a sound knowledge of ceramic colours, which are mainly derived from mineral oxides, for chemical reactions occur during firing, resulting in an alteration in many colours from the originals.

After glost firing, polishing by chiselling or tooling removes any small marks left by the refractory supports, then any roughness or blemish is removed by fine grinding on a carborundum wheel. Finally, the article is polished by a flannel or wood wheel. Stencilling and ground laying are two other operations not described in detail as also is lining, this last a most delicate process of line decoration by hand. Inspection of the finished product is rigorous in the extreme. Every single piece has to be passed not only as sound, but as accurately representative of the high standard of Wedgwood articles. Packing is done in barrels and casks, pottery being packed tightly, and it is rare for breakages to occur in overseas shipments.

For the manufacture of first-grade bone china and earthenware china and ball clays are brought from the West of England, mainly from Devon, Dorset and Cornwall, Pure china clay is a hydrated silicate of alumina, Al_2O_3, $2SiO_2$, $2H_2O$. Every ton of clay used needs from 9 to 12 tons on long-flame coal to fire and bake it, except where the new electric ovens are being installed, and this is the nature of the coal mined in the North Staffordshire coalfield on which Stoke-on-Trent is situated. Electric and gas-fired ovens are now replacing the old coal-fired plant used from the earliest days of the pottery industry until the 1914-18 period.

What is now termed bone china, really semi-porcelain, the staple product of many potteries, was brought into being by Spode during the early 19th century. The firm of Spode is now part of W. T. Copeland & Sons Ltd., at

Please turn to page 88

The traditional art of the thrower has been handed down through generations. Practically the only alteration in method has been the adoption of electric drive for the turntable in place of the foot operated potter's wheel.

JOTTINGS

A FURTHER INDICATION OF THE wisdom of employing modern production technique is the announcement by Associated British Oil Engines, Ltd., that due to improved methods of manufacture they are enabled to reduce the selling price of the small Petter single cylinder, air and water cooled, petrol and petrol/paraffin engines. A price decrease of 20% has been effected, and this in face of rising material costs.

CRANE PACKING, LTD., MANUfacturers of heat exchanger tube packings, lubricants, jointing seals, extractors, and tools for condenser packing, has been acquired by Tube Investments, Ltd. Future plans include output expansion to meet increased demand for the Company's products.

READERS POSSESSING DIE-HEADS, screwing machines, or handstocks, who experience difficulty in obtaining replacement screwing dies, will be gratified to note the appearance of a useful manual published by W. H. A. Robertson & Co., Ltd., Lynton Works, Bradford. The book illustrates sixty-six Warco dies and in connection with each are listed those dies of other makes which may be replaced by the Warco model. In all, some three hundred dies and chasers of over ninety British, American, and Continental manufacturers are grouped with possible Warco replacements.

THE BOARD OF TRADE HAVE appointed July 1, 1948, as the date on which those provisions of the Companies Act, 1947, not then in force will come into force. Simultaneously, Table A and the form of annual return has been revised as from July, 1948 ; and will appear in its revised form, in the schedules to the Bill to consolidate the Companies Acts to be introduced in the House of Lords, March 8. Section 120 (2) of the Companies Act 1947 empowers the Board of Trade to amend certain schedules of the Companies Act 1929. It is under this authority that the above mentioned revision of Table A and the form of return has been undertaken.

If you are interested in finishes and finishing procedure it is probable that our Companion Journal "Product Finishing" will be of value to you. Why not send for a specimen copy? There is no obligation.

BROOK MOTORS NEW FILM giving customers at home and abroad, under the title "Distinguished Company," an overall action picture of A.C. electric motor construction at the Brook works by up-to-date methods is sufficiently technical to provide information to those who require it without sacrificing general interest. Twelve copies are being circulated throughout the world.

THOS. W. WARD, LTD., ALBION Works, Sheffield are the publishers of *Factory Planning and Installation*. Also available from this firm is their catalogue "Small Tools List."

ONE QUARTER OF FORT DUNLOP'S consumption of cotton cord used in the building of tyres, is to be supplied by the new mill which began operation March 20. Located at Fort Dunlop, the mill has been equipped with redundant machinery from the Rochdale site. Three hundred operatives are employed, a number of whom are ertswhile Dunlop workers who have completed several weeks intensive training in preparation for their new work. The mill is operating on a twenty-four hour schedule of three shifts ; for this reason women are not employed.

RESPONSIBILITY FOR THE PHOTOgraphy of stands and exhibits at the Mechanical Handling Exhibition, Olympia, July, 1948, has been placed with Rooster Publicity, Ltd. This firm will also act as Official press photographers.

A RANGE OF CARBON VARIABLE resistors, utilizing the property of fluctuating resistance between adjacent carbon conductors under fluctuating physical pressure, is being produced by the Morgan Crucible Co., Ltd. The Morganite Carbon Pile has been employed with considerable success in voltage regulators, motor starter and speed control circuits, and in radio equipment. In the latter application interference due to intermittent breaking of the circuit is avoided, and the absence of inductive properties may, in some instances, be important.

A £70,000 CONTRACT HAS BEEN drawn between The Brush Electrical Engineering Co., Ltd., and the Saudi Electric Supply Co., of Mecca. The British company has undertaken to supply power station and distribution equipment to be used in the installation of an electric supply system in the Saudi-Arabian town of Taif. Capacity of the power station will be 1,200 kW., supplied by four diesel driven alternators. Transmission lines and poles will be supplied by British Insulated Callender's Cables, Ltd.

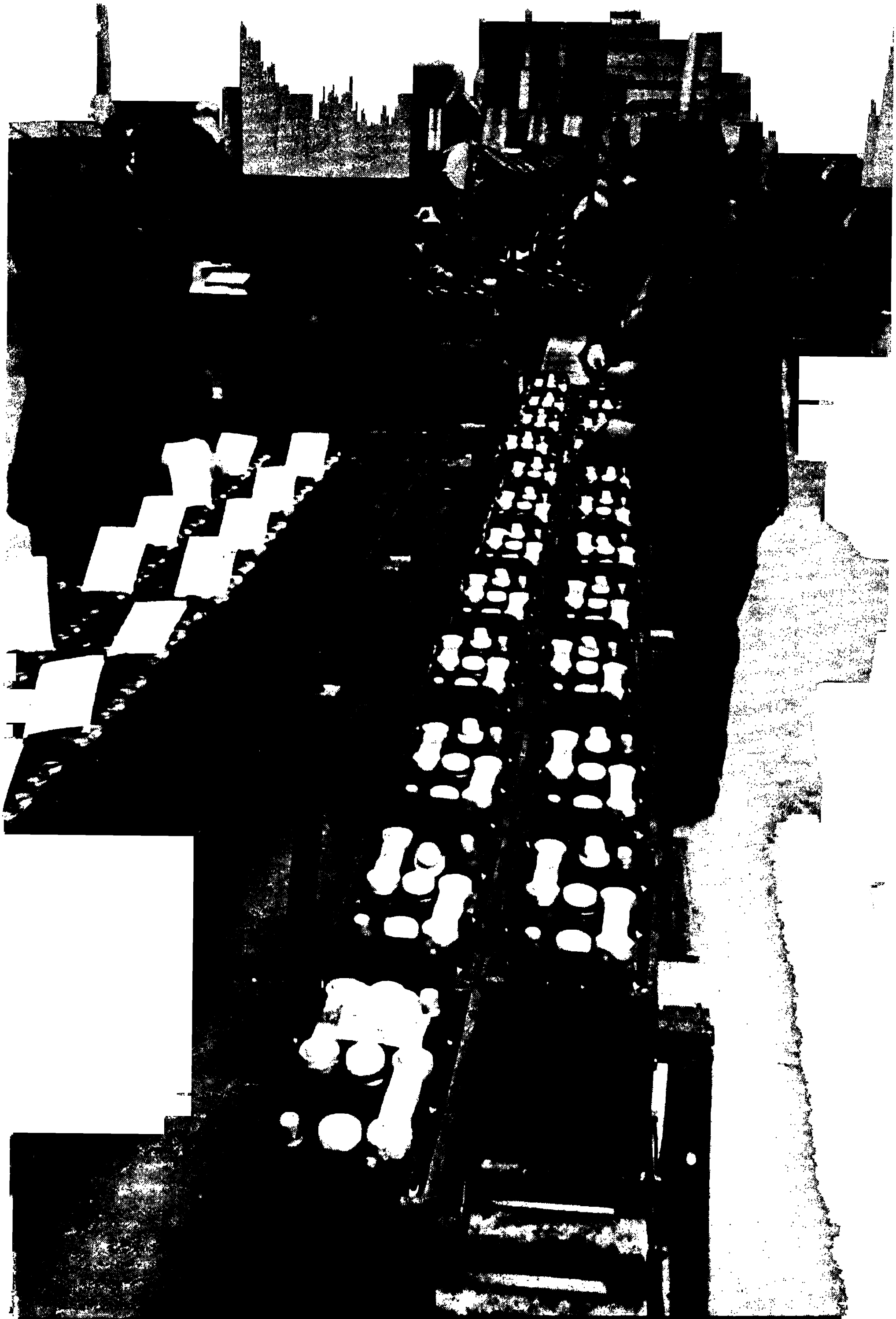


PHOTO of the MONTH

Mechanise

THE diagrams on pages 60 and 61 show the floor layout of one of the most highly mechanised foundries it has been our privilege to visit. We refer to the foundry operated at High Wycombe by Broom & Wade Limited. for the production of all types of castings for the range of pneumatic tools, air compressors and accessories made by this well-known firm.

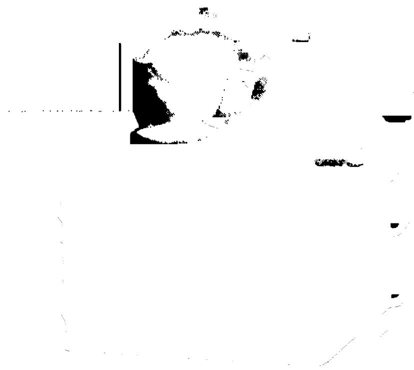
The entire operation is mechanised in the case of light castings and about 60 per cent. of the work is mechanised in the case of the heavy castings. This mechanisation has been brought about by the adoption of labour saving devices wherever possible ; coupled with an intelligent planning of the handling and conveying gear to suit the requirements of the particular type of production involved.

As will be seen from the diagram, the light casting section is serviced by a special type of mould conveyor which has interlocking ends so as to present a smooth and continuous surface for carrying the moulds.

The logical place to start a description of this particular layout is at the point where the moulding sand is fed to the battery of plate

A general view of the mechanised light castings section of the foundry

Foundry



moulding machines at the bottom end of the floor plan. Sand comes to these machines from an overhead belt conveyor which brings it from the sand treatment plant shown at the top end of the plan.

The sand is deflected from the conveyor as required by chutes which direct it onto the top of the moulding table of the machine, upon which the pattern and mould box have been pre-positioned by the operator. When the flask or moulding box is completely full, it is levelled off and the sand is mechanically rammed by the machine with a bouncing, jolting motion that ensures the complete and homogeneous packing of the sand around the pattern.

Having been rammed, the pattern is now withdrawn from the mould by a vibrating action on the machine and the mould is transferred to the short roller conveyor section where a moulder closes it, locks the sections and makes a few minor adjustments if required whilst the next mould is being rammed on the machine.

Leaving the short roller conveyor the mould now passes onto the main moving conveyor which is to carry it round to the pouring point. It is normal practice to allow the moulds to accumulate on the main conveyor whilst waiting for the furnaces to reach pouring temperature. The moulds thus pass round the circuit and back to the pouring point until such time as they arrive at a period when pouring is in progress.

It must be borne in mind that the capacity of the conveyor is considerable and it serves as a storage unit for the moulds whilst they are waiting to be poured. This system has the added advantage that, when the pouring operation starts, a steady flow of moulds is passing in front of the furnace with the minimum of delay between individual pourings.

Having received their charge of molten iron, the moulds continue round the circuit until they reach the return side of the conveyor at the point where the knockout grid is positioned. Here the casting is knocked out and the sand falls through the grating to an underground belt conveyor on which it rises to the sand treatment plant again for pulverising, milling and treating to enable it to be re-used.

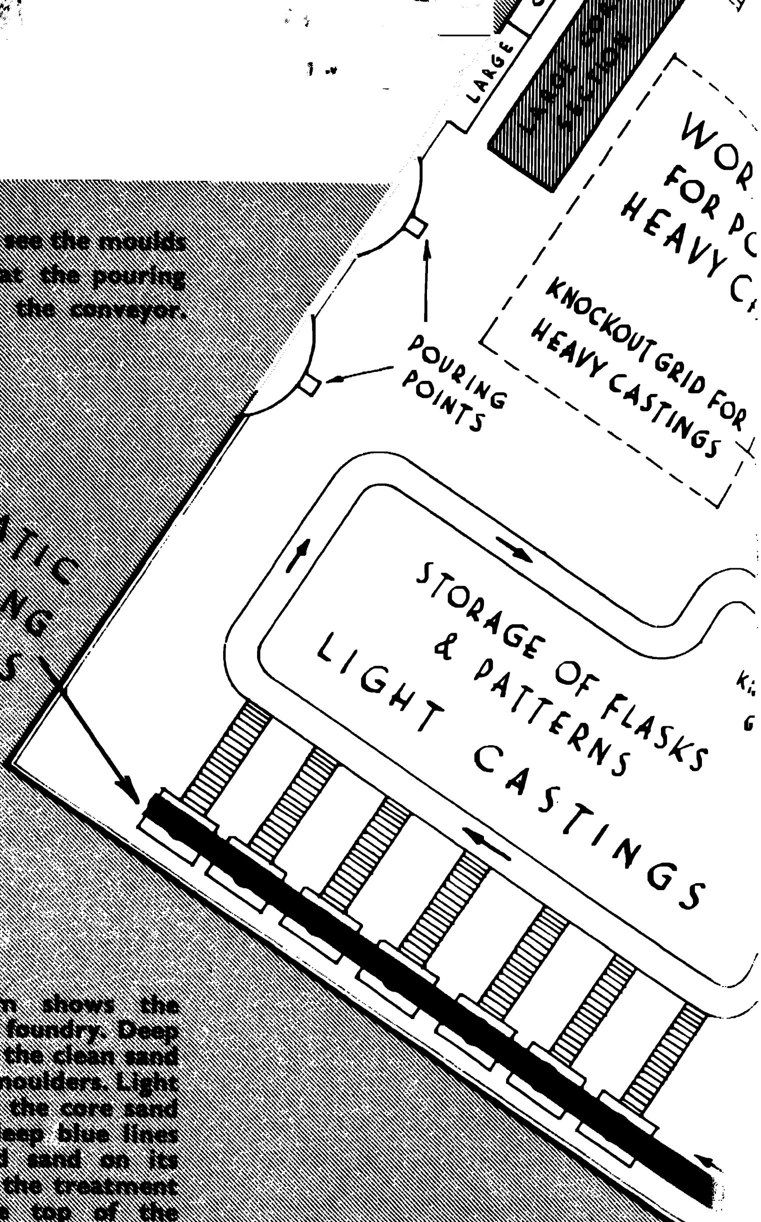
Cores for the light casting section are made in a special core shop which is just as highly mechanised as the main moulding section. The sand is fed from the sand treatment plant, by another belt conveyor, to chutes and bins situated beside the tables or benches on which the girl coremakers work.

All these benches in the light core shop are served by a pendulum type of conveyor which carries the cores away from the girls to the core oven in which they are baked hard. The conveyor and the benches may be seen in one of the photographs on these pages.

The oven is of special construction, being hump-backed and of considerable height so as to ensure that the cores receive a thorough " soaking " at the right temperature and the capacity is such that it can deal with the maximum output possible, within the limits imposed by the speed of the conveyor. The completed cores are stacked on a special type of truck to await transport to the foundry

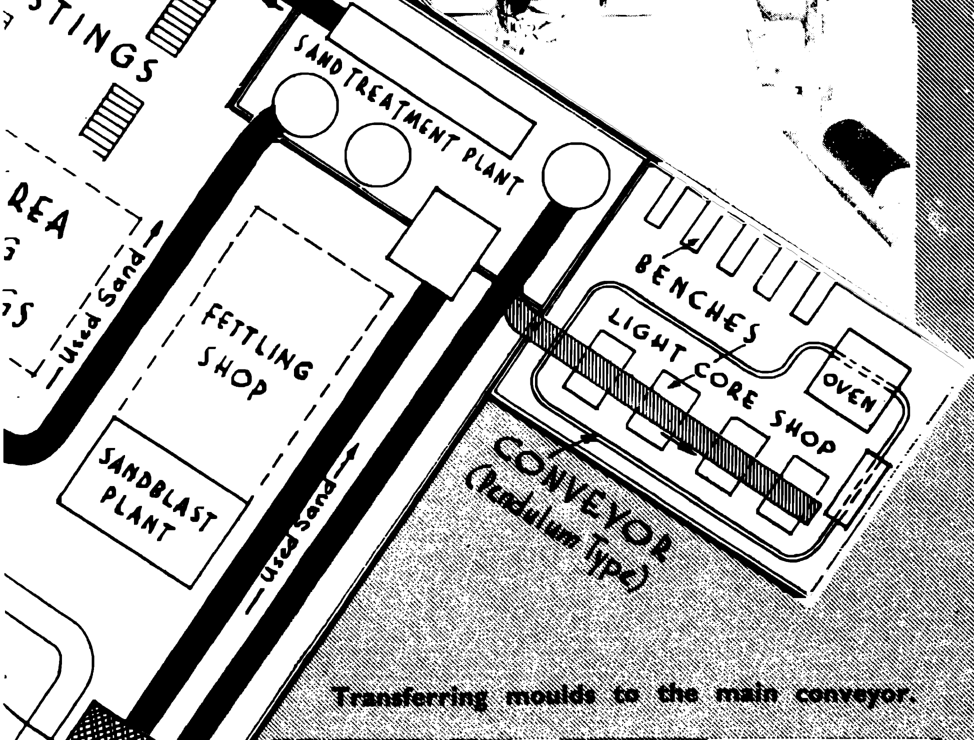
Diagrams on pages 52 & 53.
Text continued on page 54.

Here we see the moulds arriving at the pouring point on the conveyor.

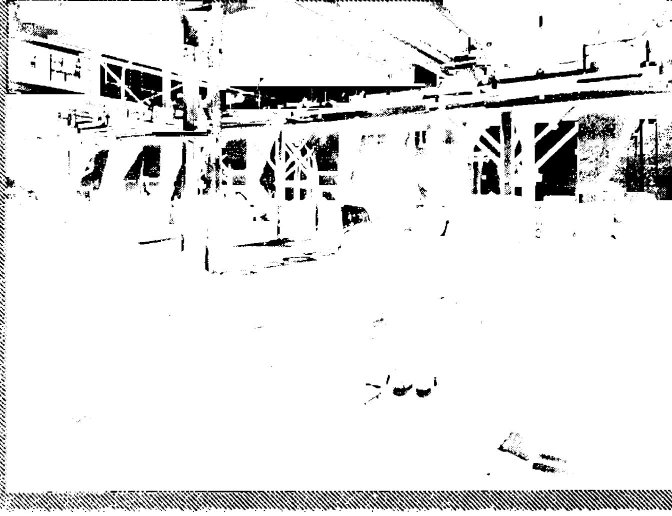


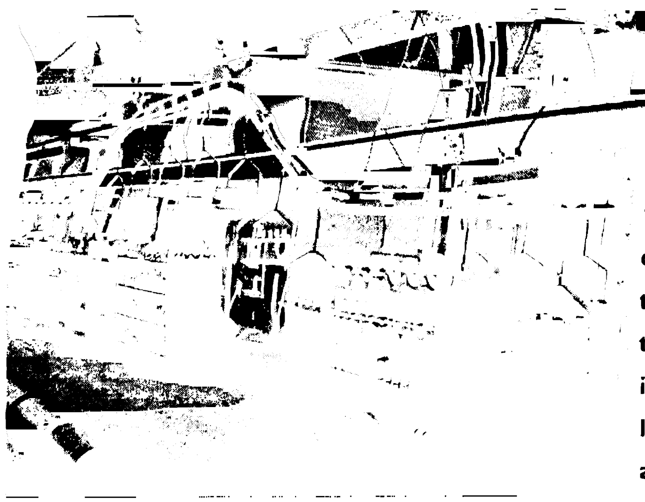
This diagram shows the layout of the foundry. Deep red lines are the clean sand going to the moulders. Light red lines are the core sand supply and deep blue lines are the used sand on its way back to the treatment plant at the top of the diagram.

A view in the light core shop

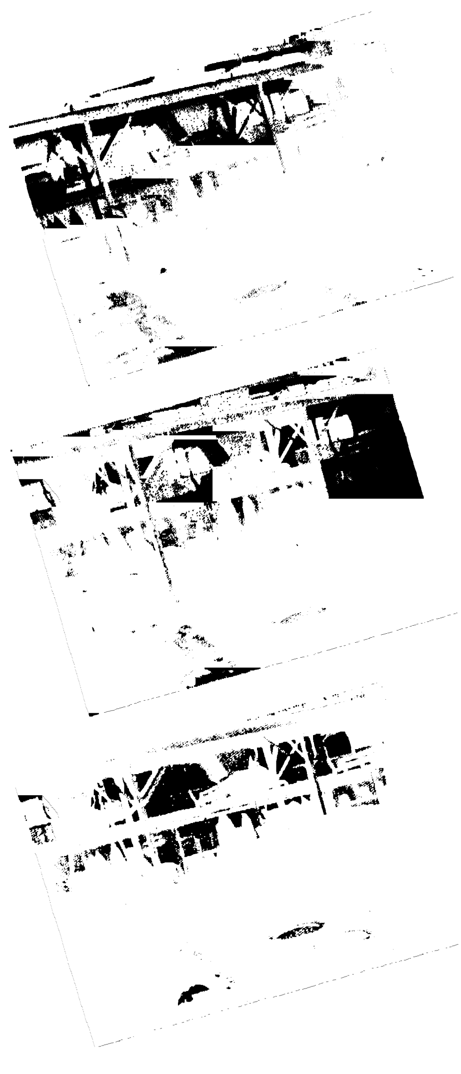


Transferring moulds to the main conveyor.





This view of the light core shop shows the *pendulum* conveyor, the core transport trucks and part of the core backing oven in the background. All the light cores required in the fully mechanised light castings section are made here.



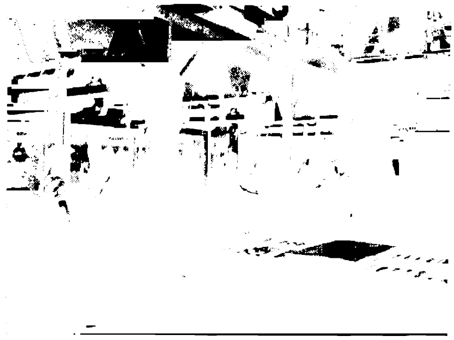
proper, a few of these trucks with their load of cores may be seen in our photograph.

Cores for the larger type of castings, and the firm do make some very big castings for their large compressors, are made in a section of the foundry which is specially set aside for the purpose. This section is shown on our floor plan and is adjacent to the large core baking ovens which project through the outside wall.

At the top end of our floor plan is shown the heavy casting section where most of the really large castings are made. It has not, of course, been possible to mechanise this to the same extent as was done with the light castings section. Nevertheless, considerable thought has obviously been given to the layout to achieve the maximum output with the minimum of effort.

The sand is fed to these heavy moulding machines in a similar manner to the arrangement at the other end, but the sand is fed direct from the conveyor belt instead of from chutes. The conveyor start and stop control is positioned just above the machine and the moulder releases just as much sand at a time as he requires to ram the mould.

Three views of the heavy moulding machines showing the conveyor, sand feed belts and roll-over gear for transferring moulds to the conveyor for subsequent removal to the pouring section.



In the lefthand picture the moulder is seen to be ramming the mould with a pneumatic rammer and in the right-hand picture a mould is seen being rammed by the jolting action of the machine.

Ramming in the case of these large moulds is a matter of combined hand, air operated tool and machine ramming according to the judgement of the moulder. The pattern is positioned and the moulder carefully directs the sand as he wishes until it is ready for ramming. He then presses it down by hand or foot and then with a mechanical rammer until the mould is full and he is satisfied with it.

The operators in the heavy moulding section are mostly experienced moulders with many years service whereas, in the light section, a large percentage of the labour need only be semi-skilled. Consequently there is a larger proportion of hand work in the havy section and much of this hand work is normal foundry practice as met with in other foundries.

Owing to the size and weight of these heavy castings they are not conveyorised as are the smaller ones. The usual procedure is to run them from the moulding machine onto the short roller conveyor from which they are picked up by crane and taken to a clearing on the floor which is reserved for pouring out the heavier castings.

Here they are within reach of the monorail conveyor which is built around the pouring point. Molten metal is brought to the mould and the casting is poured in position on the floor. After pouring they are allowed to cool in position until such time as they are required.

At the time of our visit a new vibrating knockout had just been installed to deal with these heavy castings and we were able to watch it at work. The casting is lifted by crane and placed in position over the grid of the knockout. The power operated shaker is set in motion and the sand is broken up and dislodged to fall through the grating in the floor.

From this grating another conveyor belt rises and carries the sand up to the sand plant as in the case of the light castings. The great advantage of the vibratory method of removing the sand from the flask or box is that it falls away and is removed downward through the floor without forming the usual heaps of sand that characterise the normal foundry method. There is also much less dust present in the air.

On the left of the heavy casting section may be seen on our diagram a dotted line enclosing the fettling shop. This is situated between the two rising sand conveyors and is laid out to handle all types of castings. It includes a sand blast chamber and is equipped with a complete range of air operated tools for chipping, grinding and finishing off the many intricate shapes of castings that are produced by the foundry.

At the side of the foundry we visited the laboratory which has been instituted to keep a strict check on all materials and processes and is very well equipped, being provided with chemical and physical testing apparatus including tensile and impact testing machines and many other instruments and recorders.

The foundry is supplied by two furnaces which are built outside the walls in the positions shown on our plan and these are equipped with mechanical handling gear for loading the charges of fuel and iron into the top.

MISCELLANY

BRITISH PHOTO-ELECTRIC EQUIPMENT

EQUIPMENT, the operation of which depends on the properties of the photo-electric cell, has been common for some years. However, since the production of the actual Selenium Cell was not, until the last war, carried out in this country to any great extent, development of photo-electric equipment by British firms was not extensive.

Recent research and experiment, initiated by the demands of war, has indicated many new possibilities of the Selenium Cell in industry. Evans Electroselenium Ltd. has taken advantage of the results of this research activity by applying the Selenium Cell to the needs of industry in a number of novel ways.

Previously the matching of colour to a given standard shade was entirely dependent on the human eye and therefore subject to the vagaries of human judgement. The Reflectometer now enables this matching procedure to be carried out with scientific precision and with any predetermined degree of variance from the standard shade. Where the composition of a liquid solution must be rigidly controlled, or its variations accurately determined, the Colorimeter may be found invaluable.

Although much time and effort has been devoted with advantage to devising new photo-electric equipment, of which the foregoing are examples, the major function of the Selenium Cell continues to be that of actuating electrical relays which in turn control secondary circuits. This field has not been neglected by British engineers. In this connection barrier layer cells may be made to perform scores of duties ranging from the automatic switching on of lights when natural light fades to the operation of counting mechanisms providing assembly line statistics. In passing it may be noted that the multiple Selenium Cell has a sensitivity comparable to that of the human eye.

RAW MATERIALS GUIDE

THE Board of Trade have published a revised Raw Materials Guide which sets out all the raw materials at present controlled by the Board and by the Ministry of Supply.

It gives particulars of the relative statutory orders in force together with information concerning the various changes affecting raw materials which have taken place since October 1946. Details are also given of the types of control at present operating and the addresses at which enquiries may be made.

Copies of the Guide are obtainable, price 1/6, through any bookseller or newsagent, or direct from H.M. Stationery Office, Kingsway, London, W.C.2. and branches.

NEW TYPE INDUSTRIAL LENS

A NEW type of industrial inspection lens for those who work with very small manufactured parts, such as watch components, miniature radio valves, and fine textile fibres will be exhibited at the British Industries Fair, opening on May 3.

Make of methyl methacrylate, a plastic material half the weight of glass, this new lens is remarkable because, unlike an ordinary magnifying glass, it gives both eyes at once a clear and undistorted image over the whole field of vision. It has been thoroughly tested by the Medical Research Council.

The new technique enables a large number of plastic lenses of the highest optical accuracy to be produced from two carefully ground glass moulds in a comparatively short space of time. The development of this new visual aid is opportune, as at the present time there is a marked tendency to produce smaller working parts and finer textile fibres. Operatives working with these are subject to considerable eyestrain.

Of interest to packers of perishable foodstuffs is a very high grade " Alkathene " plastic film in widths up to about 48 in. and from one thousandth to ten thousandths of an inch thick. This film has a high water impermeability, tear resistance and heat-sealing properties.

There are 71 plastic manufacturers exhibing at B.I.F. and they occupy some 25,000 sq. ft. on the ground floor at Earls Court.

SIGNED RETREADS

An admirable step has been taken by the Retread Manufacturers Association to safeguard the public against inferior workmanship in retreaded tyres. Henceforth, member firms will be required to brand all tyres, leaving their works for distribution to the public, with an identifying mark. This obligation is intended not only to raise the level of craftsmanship throughout the industry, but to protect reputable firms from the prejudices implanted in the public mind by unfortunate experiences with poorly executed retread work.

It is hoped that eventually the plan will become general in the industry, being voluntarily adopted by firms not connected with the R.M.A. To further this end a directory of brand-marks is being compiled by the Association which will be placed at the disposal of the tyre trade.

MOLASSES PRICE INCREASE

A further effect of Japanese wartime occupation of the East Indies is being felt in the world shortage of Molasses. Although the bulk of world supplies originates in Cuba, with a lesser yield from the British West Indies and the sugar beet industry, the devastation of the Eastern cane fields has resulted in a tremendous and in proportionate increase in price.

The world market condition is reflected in a Board of Trade announcement that as from April 1, 1948, the selling price of molasses, for all purposes other than cattle feed, will be increased. This price adjustment must necessarily be passed on to molasses derivitives, i.e. industrial alcohol and its derivatives yeast, citric acid. However, where alternative methods of production are possible, not involving the use of molasses as a base, the price of these commodities may remain unaffected.

HIGH FREQUENCY IN THE BAKERY

The application of High Frequency heating to the baking trade was discussed at a lecture and demonstration given by Mr. L. D. Price, B.Sc., B.Sc. (Eng.), A.M.I.E.E. of the General Electric Company, and held under the auspices of the Unilever Bakery Service at Unilever House (March 11).

Although high-frequency methods of heating are already established on a commercial basis in certain industries, Mr. Price pointed out that experiments with regard to baking were only in a laboratory stage. " There is a big gap between successful laboratory experiment and a practical commercial installation," he said, " and general acceptance of the process in the baking industry cannot be expected in the near future."

Mr. Price emphasised that the economic factor needed careful consideration. " It was not possible," he said, " to give an exact analysis of the economic outlook, but rough calculations showed that equipment costs left the commercial prospect open to doubt."

Bread and cake were cooked in five minutes during the demonstration by means of a five kilowatt High Frequency installation.

HINTS TO BUSINESSMEN

Businessmen contemplating a visit to an overseas country would be well advised to take advantage of a source of useful information provided by the Board of Trade. We have in mind the series of booklets entitled " Hints to Businessmen."

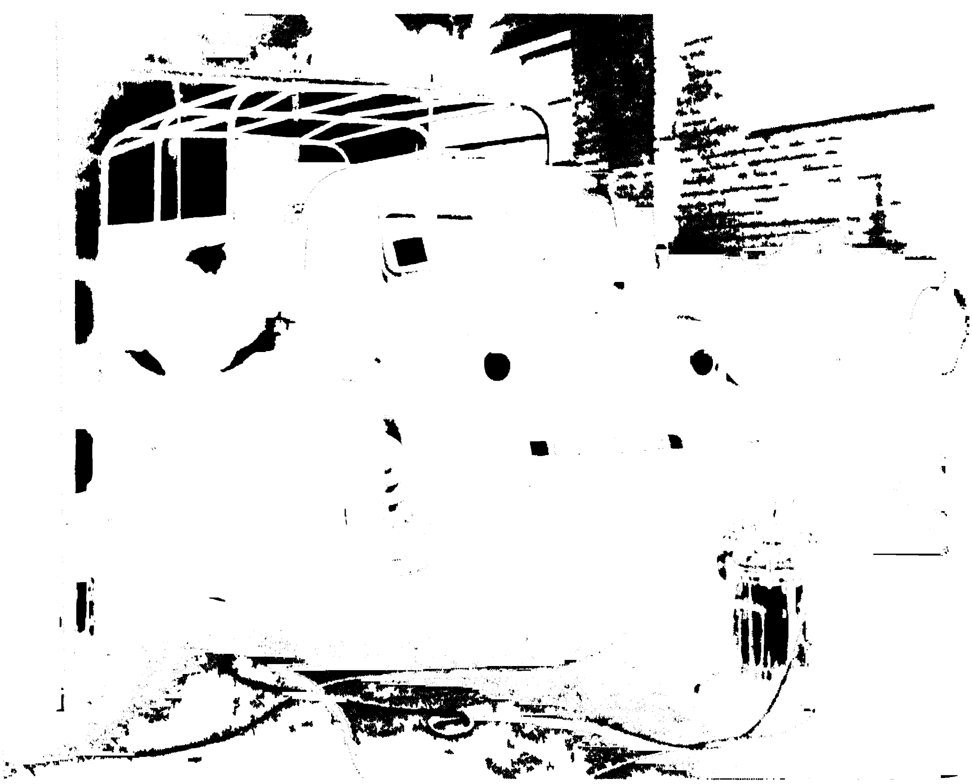
Too often do our business representatives abroad labour under a self-imposed disadvantage in being unacquainted with the peculiarities of the land in which they are seeking orders. Doubtless they will be thoroughly primed in the merits of their product, but it is also important to have a grasp of the many points of local custom and business practice; a knowledge of which can add so much to goodwill, and go so far toward smoothing the path of the stranger.

The series consists of thirty-five booklets relating to the following countries :

Argentine ; Paraguay ; Uruguay ; Australia ; Brazil ; Belgian Congo ; British East Africa ; British West Indies ; Canada ; Central America ; Columbia ; Cuba ; Dominica and Haiti ; Ecuador and Peru ; Egypt ; Switzerland ; Finland ; India ; Iraq ; Newfoundland ; New Zealand ; Persia ; Portugal ; Madeira and Azores ; Portuguese E. and W. Africa ; S. Africa ; S. Rhodesia ; Spain and Canary Islands ; Sweden ; Turkey ; Venezuela ; Belgium ; France; Eire ; Mexico ; Palestine ; U.S.A ; Bolivia and Chile ; Denmark ; Norway.

The booklets on Central America and Iraq have recently been revised to keep them abreast of present conditions in those countries. The series is issued by the Export Promotion Department of the Board of Trade, and is made available to *bona fide* business-men with definite plans for an overseas trip.

DESBOROUGH ENGINEERING COMPANY



As a general rule all the firms who have provided material for our monthly deliberations have all had at least one thing in common, they have usually been concerns with a long history behind them. This month, however, we have decided on a change; we shall tell the story of a firm who have actually been working as a unit for only a short time, a little over a year in fact, but in that time their achievements have been such as to merit the use of that adjective on which this feature is based—Enterprising.

Another unusual thing about this particular firm is that they *do not actually make anything* ! They are as a matter of fact a sort of modern Aladdin among firms in that their activities are entirely devoted to offering " new lamps for old " but in this case for " lamps " please read " lorries." Another point is that they only offer their work to the British Government, and thereby hangs a tale.

That is what the Desborough Engineering Company is doing and they are doing it extremely well as we saw for ourselves when we recently went to High Wycombe to investigate a rumour that had reached us through other channels. On this occasion we spent the best part of an afternoon there as guests of Mr. L. T. Wilkinson, General Manager of the depot.

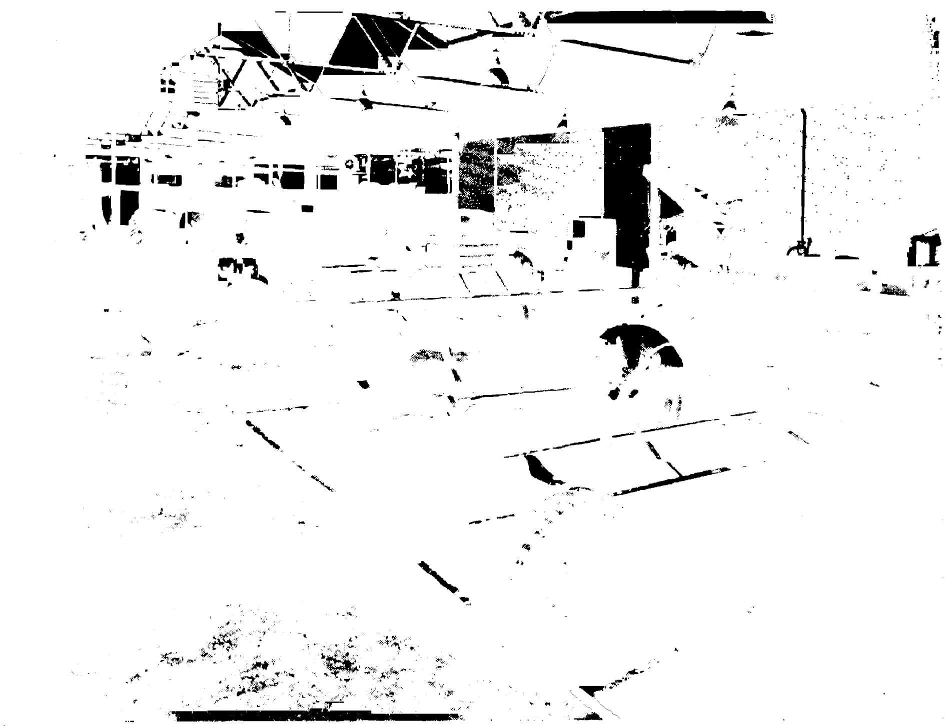
To get to the beginning we have to go back to December, 1946 when J. Brockhouse & Co., Ltd., of West Bromwich, undertook to set up this unusual factory for the Ministry of

Supply F.V.3. as a Central Stores and to organise separately a Production Department for the complete stripping and rebuilding of Government owned M.T. vehicles which were beyond normal repair by Service organisations.

That was the first surprise we had on that sunny afternoon, for although the name Desborough Engineering Company didn't seem to mean much to us, the name Brockhouse was a different proposition. As they so aptly put it themselves it is a name that "carries weight." and that name alone was sufficient guarantee that we were about to see something out of the ordinary.

The factory in Desborough Avenue, High Wycombe from which the Company takes its name and in which they have their being was originally a war-time foundry for the production of light alloy castings and was in a very bad state when they took it over. It had been in disuse for many months and most of the buildings had a derelict appearance. Our guide pointed out to us the deep encrustations of corrosion on the beams and girders in the roof, a legacy from the acid fumes from the former processing plant.

There was, in consequence, much to be done and the task of making the premises suitable for their new purpose was one of some considerable magnitude. Renovations were put in hand only where absolutely essential and some of the work is as yet unfinished. Even as we went around the factory, workmen were repairing and altering parts of



the buildings.

We started our tour at the " dump " at the end of the road which runs down between the buildings and we stood gazing in amazement at the collection of battered wrecks that lay in various attitudes around the field which serves as a vehicle park.

These vehicles are brought in by the Army from all parts of the Country and they are vehicles that have been classed as " beyond repair " by the R.E.M.E. and the other Service units. " Believe me " said our guide, " when those people say they are beyond repair, you can bet your life they are pretty bad." From the evidence before our eyes we felt he had put it fairly mild even at that ! The vehicle shown in the photograph at the top of the title page of this article is typical of the condition of many of the wrecks we saw lying in the park there.

Before we started on a tour of the factory proper we asked our host for some more details of the work done and the ultimate aims of the firm. We learned that whilst at present the factory is only rebuilding the three ton load capacity, open truck type of vehicle, the intention is to set up similar production lines to deal with any type or make of Service vehicle ; lorry, car, or van.

The procedure is to bring the vehicle up from the park and remove the body and cab. These are sent to the respective departments for repair, reconditioning or rebuilding as may be necessary. " We shall come to the various sections as we go along " said our guide. The chassis is then sent over to the steam cleaning plant to be cleaned down.

Returning from the steam cleaning section the chassis goes in to be stripped down and it takes its place in the line for this purpose. Everything is removed until only the two side members and the cross members are left. The chassis frame is now checked for alignment and any distortion is corrected. The old paint is cleaned off and it is given a fresh coat ready for rebuilding.

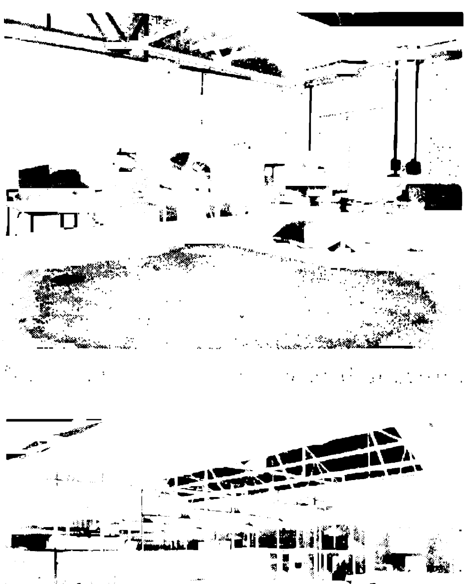
Meanwhile the various units which have been removed are being examined in separate sections of the factory. The only unit which is not dealt with on the spot is the engine as this is always returned for re-building and a reconditioned engine unit is fitted.

The factory is laid out in sections each with a production line for the particular component or sub-assembly being dealt with, for instance there is a cab line, a body line, an axle and transmission line and a section where miscellaneous small parts are repaired and adjusted.

The build-up proceeds along the line of the factory buildings until, at the top end of the road, the complete vehicle is ready for road test after which it is given a final check over and is parked to await collection. The main purpose of the factory is to enable the services to carry on without buying new vehicles, thus allowing a greater percentage of the output of new vehicles to be exported.

Sandblasting the old paint off a cab

Following our host, we went round to the steam cleaning plant and watched the procedure of cleaning a chassis down ready for stripping. The chassis is brought into position over a concrete apron and the steam hose is turned on to it. At first it does not appear to have much effect but, as the jet gets warmer and the heat starts to penetrate through the dirt and grease, the latter quickly comes away leaving the metal clean with a thin white coat of powder which rubs off by hand.



From the cleaning bay, the chassis is towed round into the main shop and is ready for stripping. We watched a group of mechanics as they removed the rear axle, sent it to a separate bay and stripped it down. Wondering what the inspection procedure was, we questioned our guide and were told that the parts are laid out and examined by the firm's engineering staff who are all qualified motor engineers. They decide which parts are reusable and which parts will have to be replaced. In case of doubt the final decision rests with the resident representative of the Ministry who is always available for consultation.

Leaving the stripping line, we followed a cab that we saw being removed and came to the cab rebuilding line. Here we saw the cab dismantled and examined for structural damage, the one we watched had no serious damage and was passed straight into the sand blast chamber (see photograph on page 61) to be cleaned off for re-spraying.

For handling purposes special trolleys have been devised, these may be seen in the illustration on page 62. Mounted on these trolleys, the cabs pass in line down the shop and are glazed, sanded down, sprayed, and all electrical fittings and wiring harness are replaced before they finally reach the main assembly point again ready for refitting.

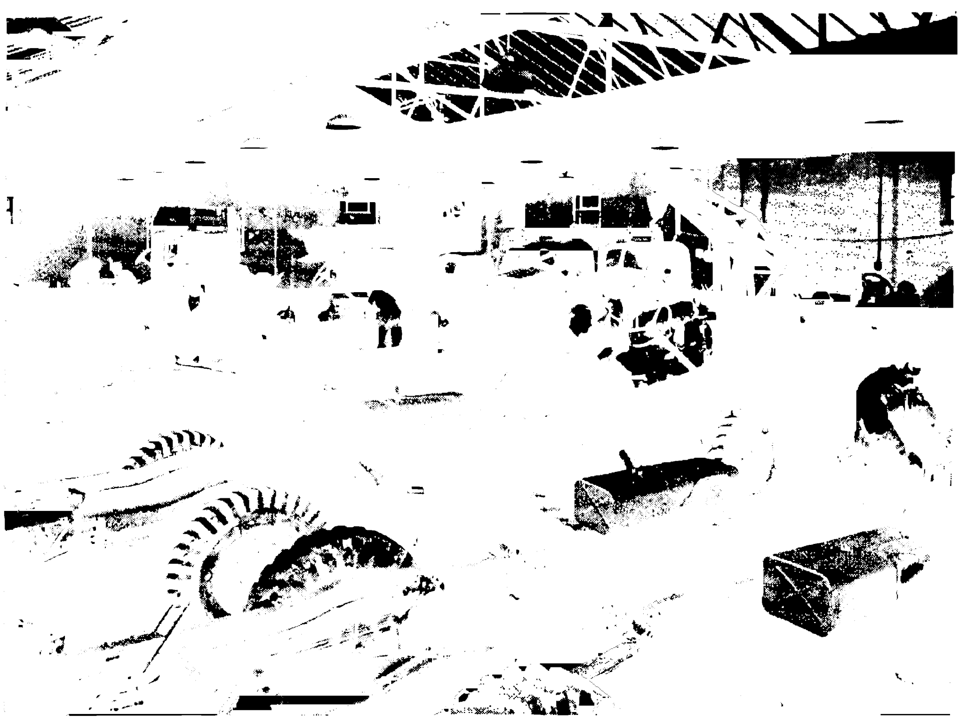
If extensive repair such as the replacement of panels or door pillars is necessary, the cab

or its component part is sidetracked to await the attention of the welders who carry out almost any repair that may be required to the metal work of both cabs and bodies. Welding and repairs to the metal work of other parts such as wings, bonnets, seat supports, etc., is usually carried out in the sheet metal section which is equipped with all the necessary gear for these jobs.

Two views of the sheet metal shop are to be found on page 61, the second from the top shows the section where the spray booths are positioned and the photograph immediately below that shows a portion of the actual repair section with its benches and fixtures.

On one side of the main shop we noticed a section set aside for tyre and wheel examination This prompted us to ask what procedure the company adopted with regard to tyres. "The tyre position " said our guide, " is so bad that it would not be possible to fit each vehicle with a new set before it leaves, so we have an arrangement whereby we fit a set of tyres that are good for a minimum of 100 miles. This takes the vehicle back into Service use and thereafter it is the responsibility of the holding unit to provide tyres in the usual manner."

Another point of interest we raised was the



reason for the fact that some of the nuts on the wheels are always painted red. Our guide enlightened us on this with the information that the outer set of nuts serve to hold the split rim in place and, should they be released whilst the tyre is under pressure, the rim could fly apart with considerable force. We were told that more than one man was killed by this type of accident in the days before the red nut marking was instituted.

Returning to the main shop we walked down the line to the point where the partially completed vehicles were being assembled and watched the procedure. As we stood there we saw an engine craned up into position and installed in its chassis and were most impressed by the speed with which the job was done. Our appreciation was increased moreover when our host told us that not one of the men we had been watching had any experience of that type of work a year ago.

We questioned this and our host pointed out that High Wycombe is not normally an industrial or engineering type of town; the main industry before the war was furniture manufacture (chairs in particular). Consequently the firm are faced with the task of training the available labour to suit their own particular requirements.

This furniture making background has its advantages, however, as well as its drawbacks for the open truck bodies usually fitted to these vehicles have a large amount of woodwork in them and the inherent carpentry skill of the local men enables them to do a better job than usual on these bodies. Local labour, our host informed us, is very adaptable and with a course of training given by the firm the men quickly learn and become skilled.

"Nevertheless," he added with a smile, "I would give anything for a gang of really experienced motor trade fitters. Yet," he added, "when you consider that we only started our first vehicle in mid-August, 1947 and, at that time we only had a labour force of 45 including the stores and administration, and now with a labour force totalling 337 we have reached an output of 12 vehicles per week, I don't think it's a bad effort. Do you?" We had to agree; it is a pretty good effort and it will not be long before they reach the target figure of 25 per week if the last twelvemonths performance is anything to go by.

Reaching the end of the assembly line we paused to look in at the electrical repair shop where the electrical gear is overhauled, repaired and tested. This small shop is set to one side of the main shop so that it can

be within reach when stripping is in progress and also be handy for the supply of wiring and parts during the rebuilding process. It is staffed by a squad of men who are under the supervision of a trained electrician and who can carry out almost any electrical repair that is likely to arise in the ordinary way.

As we passed along to the paint shop we paused again to examine the unusual arrangements for giving the engine a preliminary run prior to road test and for the purpose of making adjustments, etc. The vehicle is parked in the centre of the floor in a special section and a hose is attached to its exhaust pipe. This enables the engine to be run indoors with safety whilst making adjustments and the fumes, instead of polluting the air, are taken up and out through chimneys on the roof.

Our last call was at the paint shop on the way out and we watched a lorry being given its final touch up before leaving. As a matter of fact it was the one shown in our photograph on page 58. It looked and in fact was an entirely new vehicle but with this advantage, it had not cost the country any loss of new production and it had used the absolute minimum of new parts and materials in its rebuilding.

THE 21st International Congress of Industrial Chemistry, organised by the Society of Industrial Chemistry with the co-operation of the Federation of Chemical Industries of Belgium will be held at Brussels from 11th—19th September, 1948. At the last congress, held at Paris in 1946, twenty-one countries were represented.

M. Ernest John Solvay presides over the General Organising Committee, Prof. Van Laer over the Executive Committee, and Dr. C. Guillissen over the Scientific Committee.

There are 7 main groups to the congress, as follows :—

1. *Factory and Laboratory Organisation.*
2. *Fuels* (solid, gageous and liquid).
3. *Mineralogical and Metallurgical Industries.*
4. *Building materials, glass, ceramics and enamels.*
5. *Organic Industries* (pharmaceutical products; powders and explosives; perfumes; fats and soaps; rubber; pigments; cellulose and papers; plastics textiles; tanning, etc.).
6. *Food and Agriculture.*
7. *Industrial Organisation.*

All enquiries should be addressed to :—
Secretariat du xxi eme Congres,
Federation des Industries Chimiques de Belgique,
32, rue Joseph II, Bruselles, Belgium.

SCISSORS, capable of cutting only paper, and harmless in the hands of a child, are being produced by E.V.B. Plastics Ltd. These safety scissors have been specially designed with rounded ends to ensure complete safety when used by a young child, the cutting edge, whilst quite able to cut paper, is harmless when applied to little fingers. The scissors are manufactured from " Lustrac " Vinyl Acetate, a plastic much harder than Cellulose Acetate. When cost is a consideration in the export market Polystystyreme is sometimes used. In such cases the edges may occasionally have to be sharpened.

PERMANENT export showrooms under the auspices of International Business Services are to be opened at I.S.B. Building, 14, Arlington Street, London, S.W.1. The Showrooms will be of particular value to firms lacking a London Office, and to firms who have not yet established overseas connections; the means being now provided whereby contact may be made with buyers who are prohibited by time from venturing far from London. Prospective exhibitors may obtain further information from Mr. W. H. T. Tayleur, 66, Avenue Chambers, Vernon Place, London, W.C.1.

This new electron microscope developed by Philips Electrical Ltd., has been very carefully designed both from the functional and from the aesthetic point of view. It has a magnification of variable strength between 1000 x and 150,000 x ; The object on the left is the generator for the stablized high voltage necessary to operate the instrument and both microscope and generator have been designed as a matching pair of units in the best modern style.

By Our Market Correspondent.

Steadier Price Structure

THE unwinding of the ascending spiral of commodity values continues slowly.

Further falls in some American prices have accentuated the deflationary cycle which started in February, and which has been helped by our own Government legislation. In the opinion of competent observers, the break is not comparable to the break which initiated the sharp deflationary movement of 1920/21. But it does mean that commodity prices have passed their peak and the latest downtrend is a definite correction of the sharp rise in the second half of last year.

The Dow Jones Commodity Futures Index, which is recognised as a reliable official register, gives a figure of 147 now, compared with a " high " reached last year of 175.

There has been no assurance by the Government that socialised industries—coal, gas, electricity and railway freight, will be stabilised though it does seem that State precepts should be annealed to practical accomplishments.

The contribution from profits and costs, other than wages, towards the lowering of prices, is being watched. The Co-op. price-cutting plan in connection with household goods is regarded by some as a piece of political window dressing.

The Red Metal.

As regards raw materials and metals, there has been no change of direct help to industry. No easing of world demand for metals is being shown and prices provide an indicator of conditions in a great number of diverse industries. With the exception of lead, a metal in physically-short supply, there is little restriction on consumption although, in large part, their acquisition costs the country hard currency.

Current consumption of COPPER in U.K. is averaging 50,000 tons a month. Virgin metal accounts for more than two-thirds ; secondary the balance. The foremost consuming item is high conductivity products ; extruded brass rods and sections comes second, with copper strip and sheet, third.

World price is based on New York quotation. American producers of the metal are reported to be keeping the quotation steady because they do not want a runaway market and its danger of control. London price fixed by the Ministry of Supply remains at £132.

Notwithstanding every effort on the part of N. Rhodesian copper mines to increase output to alleviate our dependence upon supplies from the dollar areas, we are still importing large quantities from America. Rhodesian companies last year received a price averaging £80—£85 p. ton. The big difference between that figure and the Ministry's charge to industry justified the argument that it should be reduced.

Tin and Lead-Zinc Group.

TIN production in both Malaya and the Netherlands East Indies is increasing and further allocations to different countries by the Combined Tin Committee have been made. There was some resentment in London at the leakage on the Continent of the Committee's decision as this form of jumping the pistol naturally gives to traders who get premature access to information, an advantage over competitors.

The small price concession made to Malayan producers was hardly all they had hoped for but it was in line with the policy of restricting prices and profits. There has otherwise been no change and the fixed price of Tin 99% to under 99¾% is £519 p. ton.

Many European countries which have trade agreements with Holland, must buy Dutch tin (from N.E.I.). Prices there are a little above the British level.

LEAD supplies continue as tight as ever. Demand seems to be strengthened from practically every consuming source and Continental enquiries are being received in London. The strike at the mines in Mexico has had some influence on output but the market has not suffered. London price—Soft foreign pig (duty paid) £90 p. ton.

ZINC has been coming forward from U.S.A. and Canada. Britain's need for adequate tonnages, coupled with the reported continued absence of official purchases, has created anxiety amongst consumers.

Iron and Steel.

Despite rushing through the House of Lords Bill to clear the way for State steel, the Government has not yet taken over this highly profitable business which has been carried on from its genesis by private enterprise. Increasing attention is being directed to the successive records in production, but the Economic Survey for 1948 gave a warning that the physical capacity of the IRON and STEEL industry could be placed in jeopardy by the failure to resolve the potential bottlenecks of scrap, pig-iron, coke and transport. Supplies of commercial scrap from Germany, the only big overseas source of supplies, are not coming forward in the large quantities at one time thought, and reliance has to be placed on home supplies.

Most consumers of TUNGSTEN ore seem to be well bought and European buying is quiet. America still stays out of the market. She has, however been moving in connection with PLATINUM—used in specialised industries—and as a result of increasing the price, London houses have stepped up the selling price to £22 10s. per troy ounce. ALUMINIUM remains at £80 p. ton. A rise has taken place in Sulphuric acid—used in metal pickling.

On account of printing exigencies, Commodity prices and indices mentioned above were struck on a certain day during the month ; alteration in price movements since then must be allowed for

MOTION STUDY PART TWO

Following last month's introductory article, in which he outlined the orthodox motion study approach to labour rationalisation, J. M. Beskine, B.Sc. (Eng.) discusses the comparative values of the orthodox American style of motion study and the new British "Dynamic Motion and Time Study System."

JAMES J. Gillespie was one of the first experts to use micromotion photography in Great Britain. For twenty years or so he has been using motion study of the orthodox or Gilbrethian type, and applying it to the solution of problems in a bewildering range of industries, from the reorganisation of engineering factories and the mechanisation of foundries to manufacture of heavy boiler plant, packaging of sweets and face powder production. Now he is interested in coal mines and cotton . . .

Fortunately for us, Gillespie is by training a real mechanical engineer and has specialised in toolroom problems and other awkward jobs which usually frighten off those management experts who rely entirely upon pure time study and operator limb study and are unable to pay proper attention to the technicalities of methods improvement.

The result is that to-day, when an increasing number of people are interested in the possibilities of stepping-up productivity by application of motion methods, and flow study, there has been developed for their special use a new and simple method of rapidly applying motion study to all kinds of production problems.

Motion Study Ideas in Transition.

This is no short-cut to the kind of motion study which he pioneered in Great Britain, nor is it an alternative version to what is being popularised in various quarters as the very latest American technique. Gillespie has broken with orthodox motion study altogether, and has produced an essentially British method which incorporates all that is best in Gilbrethian and other ideas, but rejects its disadvantages. Actually it would be correct to say that Gillespie's new "Dynamic Motion Study" has used his experience of the advantages and disadvantages of American management techniques to develop British traditions to their logical conclusion.

It would be a great pity if production men interested in motion study did not realise that the whole basis of orthodox methods is undergoing a transition at the present moment; what is at first sight the latest idea, is on examination often found to be an outdated method. For this reason the writer feels compelled to balance his first article dealing with the orthodox motion study approach, with an account of recent revisions in Gilbrethian motion study.

Gillespie's contribution to the advancement in managerial technique is that he has improved and simplified motion study, as well as having worked out a number of other important methods of approaching incentive problems and morale. His attitude contrasts with the long line of motion study experts who have paid attention to this or that disadvantage of Gilbreth's treatment of motion study, and have initiated one minor modification after the other.

Gilbreth Displaced or Gilbreth Revised?

A recent example of this tendency to carry out minor revisions to Gilbreth is also worth noting in the present discussion. It concerns the suggestions of Dr. R. C. de Holzer who has reduced the total number of motion elements or therbligs from eighteen to nine and has worked out a method of splitting therbligs into sub-therbligs. In the writer's view this treatment may give Gilbreth's method a new lease of life and make it applicable to the design of mechanised assembly and similar processes.

It is extremely doubtful, however, if any amount of tinkering with what Gillespie calls "micromotion timing" will restore American motion study to favour for practical production work, once the essentials of Dynamic Motion and Time Study are widely known. Indeed, it is far more likely that the British symbols and presentation will replace Gilbreth's original ones, and that the American motion study school will take over as many new British ideas and principles as they can assimilate.

It is only to be hoped that the distortions which turned Gilbreth's motion study into something which was never contemplated by Gilbreth himself, will not be applied to these newer ideas. For this reason it is strongly advisable for interested readers to familiarise themselves with Gillespie's actual works on this subject.

The Present Day Motion Study Controversy in Perspective.

It would be a mistake to imagine that the motion study controversy is an unimportant academic dispute over the details of technique. Actually it is part of a much wider issue and has a bearing on all aspects of production.

For example, one often hears about specific problems which have been "solved" by what is alleged to be motion-study; it then becomes apparent that the solution is not only unsatisfactory, but is a positive hindrance to the ultimate enforcement of the correct solution. In such a case the fault might lie with failure to see the true facts in their correct relationship and perspective. If the policy is wrong, no amount of detail improvement by motion study, or anything else, will wipe out the harmful effects of major blunders of decision or omission.

The reason for a faulty policy is as likely to be because of questionable recommendations of certain professional schools of management thought as it is to be due to bad judgement on the part of the managers or directors concerned!

In either case the root cause is the same, complete failure to take into account all the relevant factors and tendencies. Apart from the fact that the morale aspect is often forgotten and operator resistance generated, one of the reasons for unsatisfactory results, stemming from orthodox motion-studied standard answers to certain well-known problems, is that motion study can easily lend itself to unbalanced over-attention to operator movements and sub-movements, and to paying insufficient attention to methods and process improvement and to the needs of the job as a whole.

Of course, if the analytical method of assessing the effectiveness of an existing practice were to be applied by management experts to the theory and practice of motion study itself (orthodox motion study) then much good might be done—after the motion study experts concerned had recovered from shock!

Unfortunately the frame of mind which results from concentration upon solution of the problems of others, does not easily respond to the cry: "Physician Heal Thyself!"

Yet, if only more experts were to investigate their own techniques and be completely honest with themselves, would they not agree with the following view? There is a grave danger that stabilisation of industrial productivity in Great Britain at a higher level, will be prejudiced by getting over-enthusiastic about the kind of motion study which is in fact micro-motion timing.

Such a treatment can be used to speed-up operators but will not act as a permanent screen against operator resistance, nor will it compensate for lack of re-equipment of industry and failure to carry through mechanisation. The whole controversy over motion study application is part of a larger issue which is bound up with considerations of incentives, time-study, morale, and whether productivity is to be increased by (a) making use of the latest technical advances, mechanisation, standardisation, correct priorities, as well as motion and flow study of processes, operators, and operations; or (b) relying upon operator limb-study and reduction of muscular fatigue as a prelude to operator speed up instead of genuine methods improvement and rationalisation.

The issues raised above are of course, far too wide to discuss in the present article, but they should be kept in mind when considering the detailed criticisms of motion study technique.

We need many kinds of Motion Study.

It is not suggested that Gilbreth's motion study technique is "wrong" or that it should henceforth be scrapped. What has happened is that a large number of uses and demands for motion study treatment has resulted in the need for definite motion study treatments each suitable for a different kind of problem.

Motion study is really an analytical method of examining the following: (1) Human activity in terms of limb movements, and for the purposes of work or play. (2) The activity and effectiveness of mechanisms of all kinds.

Properly applied it consists of paying attention to : (a) The operation or process as a whole. (b) The individual act, action, movement, or sub-movement concerned, or a group of these at once.

(c) The relation of individual elements (as in (b)) to the process as a whole, to groups of elements, and to other individual elements.

(d) The guiding process behind the mechnical acts or motions, etc. (e.g. Considerations of morale, psychology, physiology, social pressure, in the case of human beings ; and of electricty, steam, chemistry, etc., in the case of power driven mechanisms, as well as the special characteristics of the machine or plant or circuit as a whole which give it a unique behaviour or rather response pattern).

(e) The function of the process or act, etc., both in isloation and considered as part of the complete picture. (This has a bearing on the blindness of mechanistic experts who fail to integrate in their mental conception of a problem the relations between the technical nature of a process in with its external functioning, or who refuse to let considerations of the operator as a complete human being colour their tendency to treat him or her as a lifeless mechanism).

In practice therefore, what is called for is an understanding of the basic facts in terms of:

(i) The technical process.
(ii) The human beings.
(iii) The economics of the process.
(iv) The commercial and social background.

It is essential to break-down the items examined into units. The conventional method is to use Gilbrethian " therbligs " if a thorough analysis is required, and to use larger functional units as engineering shop rate-fixers do, where this is sufficient for the purpose in hand. The British system favours use of straight functional elements and has simply shown how these can be treated as therbligs. The point, and most people will agree, is that it is quite unnecessary to introduce complications by use of minute motion elements which are really more suited for medical and pedagogical research, when motion study can be integrated with normal rate-fixing procedure.

On the other hand, where training and research is involved, there is much to be said for using Gilbrethian technique, or perhaps the revised form of it proposed by de Holzer.

For the purpose of the present discussion however, it is assumed that motion study is being considered for the following purposes only :—

(1) Improvement of a factory or plant layout, organisation, or operation.

Time to smell = ·0020 to ·0040 minutes

Time to decide = ·0010 to ·0100 minutes

Tables I, II and III were referred to in the first part of this article last month. Unfortunately, owing to pressure of space it was not possible to include them with that section and they are given here.

Table I.

The eighteen classical therbligs, based on the Gilbreth's pioneer break-down of a cycle of motions into elements.
Search — find — select — grasp — transport loaded — position — assemble — use — disassemble — inspect — pre-position — release load — transport empty — rest for overcoming fatigue — unavoidable delay — avoidable delay — plan — hold.

Table II.

Examples of job break-downs into units which are coarser than therbligs, but which are sufficiently accurate for the purposes indicated.

Work	*Elements into which broken-down*
Jig and tool drawing	Study of problem ; development of satisfactory solution ; drawing of details and general assembly ; checking of drawings.
Ploughing a field (*Morning to meal break*)	Starting up tractor ; taking tractor and implements to the field ; hitching plough to tractor, and setting it correctly ; getting into position ; ploughing ; stopping the engine, draining paraffin, etc., prior to knocking off for a meal.
Coal mining (*Working with face conveyor*)	(*Going down the shaft, and getting to the working site are excluded, as is the return journey to the surface, including washing, etc., by previous custom of payment in this industry. Other elements dealing with direct production at the coal face are as given*). Getting coal ; filling coal ; timbering. (*Timbering is split into* : measuring, dinting, fetching prop, placing bar, knocking up, etc.).
Engineering shop rate-fixing *Usual elements considered in connection with engine lathes.*	Actual cutting time ; changing and resetting ; return of saddle ; setting cuts ; grinding and setting of tools ; gauging and testing.
Cutting out shapes with oxy-acetylene equipment	Cutting time ; pre-heating ; contingencies ; setting of job and preparing to start the cut ; gauging ; trimming of edges, etc.

Table III.

An example of employment of standard therbligs in a job analysis : drilling a hole in a marked-out piece of sheet metal.

Standard therbligs.	*Left-handed work.*	*Right-handed work.*
Plan	Plan	Plan
Transport empty	Move to table	—
Grasp	grasp metal plate	—
Transport loaded	Transport to machine	—
Transport empty	—	Move to lever
Grasp	—	Grasp lever
Transport loaded	—	Depress lever
Position	Locate mark under drill	Position drill above plate
Use	Use : hold plate	Use : press lever down
Transport loaded	—	Raise lever
Release load	—	Release lever
Transport empty	—	Remove hand
Relax	—	Relax hand and arm*
Release load	Release metal plate*	—
Relax	Relax hand and arm	—

**Actually these two elements performed simultaneously.*

(2) Improvement of productive efficiency in terms of a process, operation, or flow of articles, or an organisation of services.

(3) Reasonable improvement in productive efficiency of individual operators and groups of operators, as well as fatigue reduction and work-station improvement.

If questions of re-training operators in better working habits arise, or the development of ideal human movements are under consideration, it may be necessary to subdivide the functional elements into therbligs, but here too, the new British break-down tends to focus attention onto the productive operation whereas the standard Gilbreth treatment is to pay more attention to operator actions which are outside the actual productive act. Thus, in the Gilbreth method, the therblig " use " is standardised as covering all kinds of actions from knitting to pressing a buzzer.

The British system claims, with justification, that it is not sound practice to transfer the data culled from a study of a man swinging his arm when about to strike a white-hot horse shoe with a hammer, to a girl on a light assembly operation. Both studies involve consideration of the act or therblig: " transport loaded " but they are in connection with widely different productive acts, and involve completely different rhythmic patterns.

In the writer's view there is need for development of efficient motion study techniques, each suited to a specific group of problems. Not only is it quite impossible to use the same analysis for investigating work flow problems in industry and for writing down on paper the steps of a new ballet (this is actually done) or to use the same kind of break-down for investigating the best way to apply work therapy to nervous individuals, as to investigate the prospects of methods improvement in the cotton or mining industry —but even in industry itself, it may be necessary to modify the way in which motion study is applied and used. It is an art not a science, and calls for experience and the right kind of mind.

Undoubtedly a number of different motion study techniques are desirable. For each kind of application the scale on which analysis is necessary might be different. And in every case the relationship between operator and operation may have to be viewed in a completely different light.

Thus, the kind of motion study treatment which is needed by a methods engineer concerned in getting the best out of a re-planned or recently conveyorised factory, is quite different from the motion study treatment which is necessary for the correct layout and design of an effective power station control room or of a penicillin factory. Then again, consider the problems confronting a designer who sets out to mechanise for the first time an operation previously considered as a pure manual operation and involving considerable skill and dexterity. He will need to pay closer attention to movements, if not micro-movements than does a man in charge of an automatic carpet cleaning plant !

Before going into details of Dynamic Motion and Time Study it may be as well to now indicate the writer's views on Gilbrethian motion study. This can be summed up in six items :—

(1) Gilbreth's motion study treatment remains the classic approach to the subject as a whole, and must be considered as one of the corner-stones of objective psychology, albeit somewhat one-sided.

(2) It is still valuable as a good approach to understanding some of the aspects of the study of a human being at work, but is in need of modernisation.

(3) Unfortunately Gilbrethian motion study has been distorted in the same way as Taylor's conception of time study has been distorted.

(4) It has certain disadvantages in actual industrial usage.

(5) For research, tuition, and similar purposes it can be of extreme value, but only in the hands of people without mental rigidity and with an understanding and appreciation of physiology and psychology of normal work, or of abnormality, or of preventative medicine, etc., as the case may be.

(6) Gilbrethian micro-motion analysis can be developed as a tool for the assistance of engineers interested in investigating and improving the operational effectiveness of complex mechanisms.

What are the Concrete Advantages of Dynamic Motion and Time Study ?

Six important advantages are claimed by followers of the new British school of thought. These are as follows :—

(1) Dynamic motion study can be taught in about a quarter of the time normally required. It is then far easier to apply. *Any manager or technician of average application can be taught all he requires in a series of staggered instructions on the job and in terms of his own concrete problems in a period of a few weeks* ! (This means an occasional instruction period not continuous instruction).

(2) There is an extremely simple presentation and avoidance of unnecessary complications of the kind which make usage of conventional motion study so awkward and long-winded.

(3) There is a balanced emphasis upon methods improvements and flow study.

(4) All problems are treated in relation to the job as a whole.

(5) The goodwill of the operators is gained by encouragement of operator participation in method improvement, where this is feasible and possible.

(6) Physiologically and psychologically the method is sound, and has the approval of Professor R. E. Lane, F.R.C.P., of the Nuffield Department of Occupational Health at Manchester University.

The principles of Dynamic Motion and Time Study are few and simple, but it is obviously impossible to discuss these in detail in the scope of one article. Nevertheless, enough has been said to indicate the importance of this new approach to a very old problem.

"RECOVERY of Britain is the first condition of the recovery of Europe," said Sir Frederick Bain, president of the Federation of British Industries, when he addressed the American Chamber of Commerce in London. "From that recovery," he added, "will spring the hope of peace and prosperity in the world."

This was his concluding declaration to a speech in which he had dealt with the future. "It would not be easy," he said, "for Britain to achieve her export targets in a world which was increasingly closing its doors to her exports." Nevertheless Britain was striving to the utmost to solve the problem of paying her way. He detailed her achievements in improving transport, in textiles, in steel and coal production.

"In export, I can assure you, it will not be Industry's fault if the targets that have been agreed are not achieved." he went on. "We are now beginning to see the results of two years' hard and difficult work and I am satisfied that if we can get the food and materials, my prophecy that Britain will be paying its way in the world will be fulfilled in a shorter time than many of our friends imagined."

"When I was in the United States, I met many people who found it difficult to understand how industry in this country could work in co-operation with a Socialist Government. There are not many in this room, I dare say, who share the doctrinaire views of some members of the present Government about the government of industry—I certainly do not."

Commenting that there was a difference between Britain and America arising from the differing natures of their constitutions, Sir Frederick continued: "Our Governments are elected by popular vote but they have got no fixed term of office. Events may cause an election at any time. We, the People, put the Government in, we can also put it out. Whatever the Government in power it is the King's Government and it is a maxim with us that 'the King's Government must be carried on.' In time of difficulty men of affairs have been prepared to sacrifice prejudices in order that this maxim may be realised.

"I had the honour of undertaking a mission to Canada and the United States with the blessing of the Government. Today, my predecessor in office, Sir Clive Baillieu, is leading the British Trade Mission to the Argentine. His selection for this responsible task suggests, in my view, the opening of a new phase in the relations between industry and the Government in the field of international affairs."

"But take some of the more immediate things happening at home. We are faced with an extremely difficult problem of steel allocation. The operation of the present allocation system has depended on a complex system of forms issued by Government departments. That system has broken down. I am glad that our views have been accepted by the Government and that the system will be replaced by one based on the wide extension of bulk allocation of steel direct to individual manufacturers. This change was achieved as a result of collaboration between industry and Government on a special Cabinet committee."

"Investigations are already in train in a number of industries in co-operation with the Government departments to review existing controls. A further example of co-operation will be found on cuts in capital expenditure in the private sector of industry, which is being sponsored by my Federation. This question of co-operation is an example of the spirit which should animate Western Europe today."

AMERICAN DIGEST

Bringing news of the latest developments from the U.S.A.

This product is a true solder in paste form and which becomes molten on the application of heat but without flux. By the use of " Zinctite " it is possible to perform soldering operations usually very difficult, e.g. zinc or zinc-base alloys to steel, brass or copper. It is not suitable for use on lead-tin alloys.

The cost, in the U.S.A., is about 50/- per lb.

" CorOdex " is a new liquid for rust removing which is claimed to be able to cope with up to ¼ in. in thickness.

It is non-explosive, non-inflammable, requires no rubbing and may be applied with a paint brush or mop. Afterwards the articles can be wiped clean with a dry cloth and a rust-free surface will be left.

Made by the Taber Instrument Corp., this machine provides a simple means of quickly forming a 90° crease on cellulose acetate, ethyl cellulose, vinyl acetate or cellulose nitrate sheeting 0.005 in. to 0.02 in. in thickness and up to 30 ins. wide.

The machine operates direct from A.C. or D.C. mains, as specified, and can be quickly adjusted thermally and mechanically to suit various kinds of work. Price without accessories, £168 15s. 0d. f.o.b. factory.

Machines for beading, curling and folding plastic sheet are also made by the same company.

The Taber "Thermogreaser" in action

A very useful type of self-clenching fastener has been developed by the Penn Engineering Co. of America.

Particularly useful is the clinching ring under the head. When pressure is applied between the fastener and an anvil, the clinching ring squeezes material from the sheet metal around the tapered shank of the fastener and effectively prevents withdrawal or rotation.

Because of this clinching ring the length of the shank may be less than the thickness of the sheet metal. This feature eliminates the necessity for carrying in stock a shank length for every sheet thickness.

Other features are:

1. Provides a steel thread in aluminium, copper or brass sheet.
2. Reverse side of the sheet remains flush.
3. Special clinching tools are not needed.
4. Several fasteners can be clinched in one operation.

Rivets of transparent acrylic plastics have recently been developed which are suitable for fastening plastics, light metals, leather, cardboard, etc.

These new products have a great advantage over metal rivets, when used on fragile materials, since they can be clinched without shock, by heating, and then expanding them with compressed air. This method also permits them to be used in blind holes.

After clinching, the expanded parts of the rivets can be reheated to permit modification of the shape, production of decorative heads, etc.

The American Bureau of Explosives has tested and found safe a new self-soldering tape for spliced wire joints.

The tape consists of a thin strip of solder and a thin strip of plastic in contact, and is wrapped around the cleaned, fluxed and twisted wires. A lighted match is then applied to the outer end of the plastic tape which burns and causes the solder to flow over the joint. While still hot the residue is wiped off with a cloth.

The tape cannot be fired by percussion, is chemically stable and is available is widths of ⅝ in., 1¼ in., and 1½ in.

Books

MODERN MECHANICAL SAW PRACTICE, by J. Baymond Foyster, A.B.I.C.C., *Crosby Lockwood & Sons, Ltd.*, 18/-, 274 pp.

An attempt has been made to marshal between the covers of this book the sum total knowledge and experience pertaining to mechanical woodsaws. Here is not merely a manual of saw practice as the title would indicate; the scope is more broad than that of a sawyer's handbook. As an example of this, the opening chapter concerns itself with a detailed description of a number of experiments carried out on the saws of various tooth designs to determine their relationship to wear and waste of timber. A further chapter explains the factors of physical science underlying saw design and efficiency of operation.

It is not intended that the foregoing remarks should imply a neglect of the practical side of saw mill technique. The greater part of the book is given over to saw running and maintenance. The final chapter deals with new methods of using saws, and extended uses to which they may be put if the points of setting and maintenance brought out earlier are observed.

A MANUAL OF TIME AND MOTION STUDY: *By John W. Hendry, F.R.Econ., F.I.F.M. Published by Sir Isaac Pitman & Sons Ltd.*

As modern industry advances steadily towards the status of an exact science the correct application of the principles of time and motion study is found to be increasingly necessary. However, improperly used, these aids to production efficiency may easily do more harm than good. It therefore follows that thorough training and adequate practical experience are essential qualifications of the personnel comprising the time and motion study department.

In his treatment of this subject Mr. Hendry does not attempt the impossible—the development of a qualified time study expert by the mere reading of a book. Rather does he adapt the sensible, and to the reader more valuable plan, of guiding attention toward an appreciation of the divers services time study can render if intelligently utilized. Too often is time and motion study used merely as a necessary preliminary to the establishment of standards, the management remaining blind to the many other ways in which the professional time study man can effect substantial reductions in cost. The author emphasises the personal attributes of tact and diplomacy which must always temper the time study man's relationship with labour. The examples given demonstrate how necessary are these qualities in winning the confidence and co-operation of the worker; without which an accurate study would be impossible.

The equipment of the time study department is of first importance, as are correctly designed forms to record its observations, and the author gives these matters due consideration. The actual process of taking the study and the relating of the findings to the cost system is dealt with most thoroughly. There is an interesting chapter on photography as it may be used in time study work and another on the successful application of "study" methods to indirect departments, i.e. maintenance, transport, general office.

This book is not recommended as a text book for the advanced student or already qualified man, but rather is it a sound introduction for the layman to a vast and specialised subject.

OUR RIVERS, by J. S. Kemster, *Geoffrey Cumberlede Oxford University Press*, 25/-, 300 pp.

For the fisherman, the naturalist, the manufacturer, with riverside property, and for all who take pride in the beauty of our natural waterways, this excellent book will have a special appeal. In compiling this work, the author's primary intention was to draw attention to the serious pollution of the nation's rivers. However, together with this main theme we are provided with a comprehensive survey of Britain's inland fisheries, the administrative bodies controlling them and the characteristics and breeding habits of the fish abiding in them.

In this latter connection the author reveals the life history of the salmon and sea trout, from spawn to full maturity, and the many perils that beset it throughout its life. Several chapters are devoted to the legislation and structure of the various bodies controlling our fisheries and waterways. These sections can be invaluable to those readers making commercial or industrial use of our rivers.

The documentary nature of this book does nothing to prevent it providing three or four hours enjoyable reading.

"THE MERITS OF POWER TRANSmission by Group and Individual Drive in the Textile Industry" is the title of a booklet published by J. H. Fenner & Co., Ltd., Hull. A comparison is drawn by the publishers between individual and lineshaft drive, with detailed consideration being given to their effect on plant layout, cost, and production.

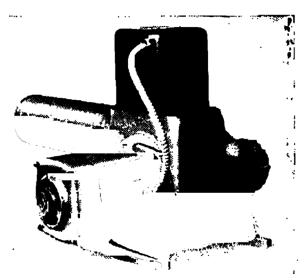
Review of EQUIPMENT

Compressor Sets

The Hymatic Mobile Compressor Set illustrated here is one that will be on show on Stand D 137 at the B.I.F. It is a modern mobile set driven by an air-cooled petrol engine and is in quantity production at the present time. Displacement 25 cubic feet per minute.

Supplier :—**Hymatic Engineering Co. Ltd.,** Glover Street, Redditch, Worcs.

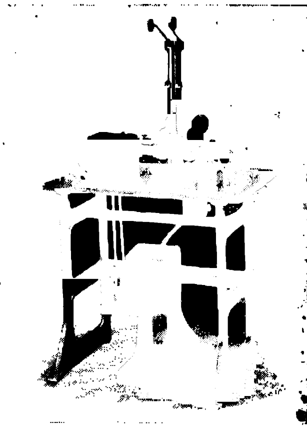
Electric Motors



This is an electric motor specially designed for use with oil-burning equipment. The motor is made in 1/16th and ¼ h.p. size and both sizes are offered in the same frame size, drive is taken from the opposite end to normal. The equipment may be seen on Stand C 306 at the B.I.F. at Castle Bromwich.

Supplier :—**Newman Industries Ltd.,** Yate, Bristol.

Coil Winders



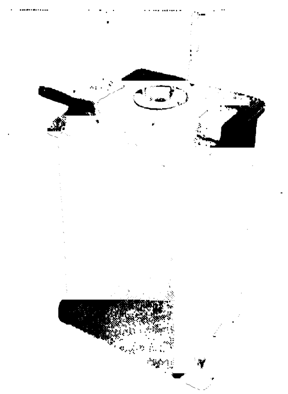
This new automatic coil winder has many new features for high speed precision coil winding. These include : totally enclosed headstock, pedal-controlled clutch, wire feed from back of coil, etc.

Fitted with Wire Guide Pulleys for winding one or two coils simultaneously. Provision has been made for winding up to four Coils at once by the addition of two further sets of Pulleys. These can be supplied to Special Order. The distance between the Wire Guides and Coil being wound can be adjusted within fine limits by the Guide Arm Height Adjusting Knob.

A special descriptive leaflet is available from the manufacturers.

Supplier :—**Kolectric Ltd.,** 20 Avonmore Road, London, W.14.

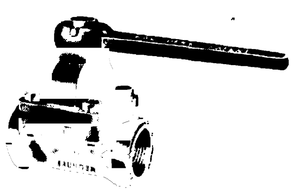
Arc Welding Equipment



On Stand No. C 222 at the Birmingham B.I.F. the Aston-Sciaky Arc Welder illustrated here will be shown for the first time. Other exhibits will be a new system of balanced three phase resistance welding.

Supplier :—**Sciaky Electric Welding Machines Ltd.,** Farnham Road, Slough, Bucks.

Diaphragm Valves



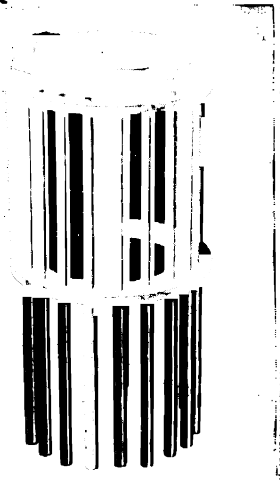
A useful valve in which the liquid does not come into contact with the Mechanism.

The mechanism is sealed off in an " engine room " of its own and the diaphragm prevents any possibility of the liquid getting anywhere but along its own channel.

Supplier :—**Saunders Valve Co. Ltd., Cwmbrn, Newport, Mon.**

Reviews of EQUIPMENT

Drill Guards



The illustration above is of the Callis Drill Guard which has the advantage of permitting full visibility with perfect safety.

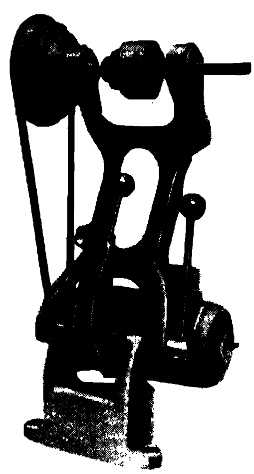
Supplier :—**International Engineering Concessionaires Ltd.,** 25a Kensington High Street, London, W.8.

Emergency Lighting

This Automatic Relay Lantern was originally developed for the use in the fighting ships during the war. It has now been adapted for use as an emergency lighting unit in halls, public buildings, etc. It will provide reliable emergency lighting in the event of mains failure.

Supplier :—**Oldham and Son Ltd.,** Denton, Manchester.

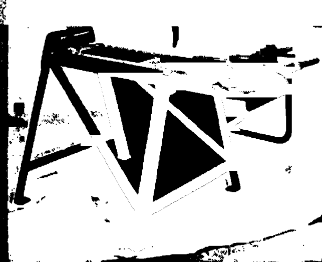
Drive Units



Here is an unusual individual drive unit for use on a bench. It eliminates overhead shafting and enables small lathes, etc., to be operated without loss of power due to slip or tight belts.

Supplier :—**Adam Machine Tool Co. Ltd.,** Hanley Road, Finsbury Park, London, N.4.

Tube Benders



Here is an illustration of a light but strong hand blender. It is a representative example of the type of machine marketed by the makers for use in the manufacture of tubular furniture, exhaust pipes, cycle parts, sanitary flushpipes, etc.

Supplier :—**Hilmor Ltd.,** 65 Calshot Street, Kings Cross, London, N.1.

Metering Instruments

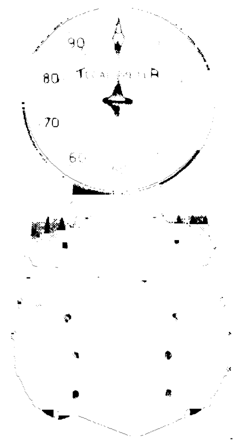


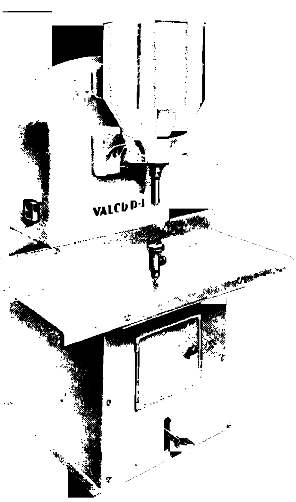
Illustration shows two alternative dial arrangements.

If you have a liquid measuring problem on your hands it is quite possible that

this "Tecalemeter" may be the answer. Space forbids a full description but it may be said that it is accurate to plus or minus 0.2% and will handle almost any type of fluid or spirit used in industry to-day. It is built in many sizes and capacities and in several variations of layout to suit individual operating requirements.

Supplier :—**Tecalemit Ltd.,** Great West Road, Brentford, Middlesex.

Filling Machines



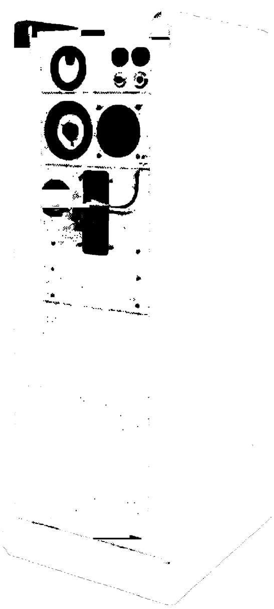
The "Valco" Model D-1 is a totally enclosed machine which packs powders into tins, drums or bottles to any required depth and density. Instantly adjustable. There are no weights, chains or brakes to adjust. One screw sets the density, another the depth of powder, and these are then constant from filling to filling.

This machine is ideal for packing aerated powders which otherwise settle down after filling, and for filling bottles or tins having restricted openings.

The operator places the container on the small platform and raises it to the filling position with the foot pedal.

Supplier :—**Valley Products (Lye) Ltd.,** Valley Road, Lye, Stourbridge.

Induction Heaters



This instrument is the "Redifon" IH.38, an industrial Radio Heater giving an output of up to 1½ kW. It is specially designed for such applications as soldering, brazing, hardening, anealing, etc. Mounted on large casters, it can be readily moved about as desired and the use of a shock-proof spring-loaded mounting for the oscillator valve eliminates the risk of damage due to vibration and movement.

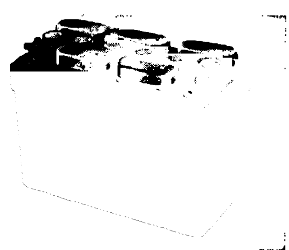
Supplier :—**Rediffusion Ltd.,** Broomhill Road, Wandsworth, London, S.W.18.

Portable Transmitter/Receiver

Now successfully tested and believed to be the first frequency modulated V.H.F. crystal controlled hand-portable transmitter-receiver, the instrument pictured on this page is known as the "Commando" It weighs only 10 lbs. complete.

Supplier :—**Tele-Radio Development Ltd.,** 177 Edgeware Rd., London, W.2.

Storage Batteries

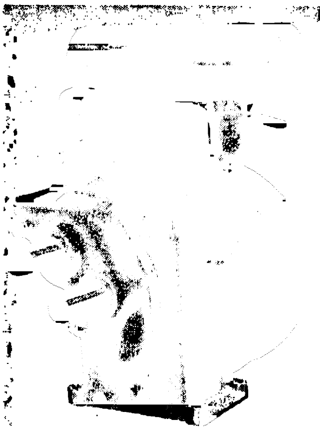


A notable collection of storage batteries for all purposes will be on show at Stand No. C 700 at the B.I.F. This illustration is an example of the type of accumulator that will be shown.

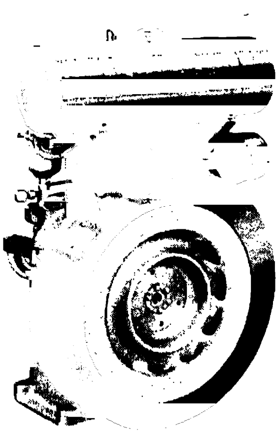
Supplier :—**Pritchett, Gold and E.P.S. Co.,** 50, Grosvenor Gardens, London, S.W.1.

Review of EQUIPMENT

Stationary Engines



In our opinion, the Armstrong Siddeley Engine shown here has been improved by the recent alterations which have been made in its style and layout. It is an air-cooled single cylinder job developing 5, 6, 7, or 8 h.p. according to the speed it is run at (within a range



of 900—1200 r.p.m.). The fuel tank, formerly cylindrical, has been made rectangular and the appearance has been cleaned up generally. Adaptors are available for taking the drive from either end and the drive may also be taken at half-speed from the camshaft. The present output of these engines, we are told, is about 500 per month.

Supplier :—**Armstrong Siddeley Motors Ltd.**, Coventry.

Loom Motors

The design of totally enclosed motors has been a Newman speciality for some time now. The example shown here is a totally enclosed loom motor which will be on show at the B.I.F. this year. It may be seen on Stand No. C 306 at the Birmingham Section.

Supplier :—**Newman Industries Ltd.**, Yate, Bristol.

Air Compressors

In the adjacent illustration is shown an air compressor of unusual design. It is a two stage, multi-cylinder machine with an inter and aftercooler arranged in front of the compressor. This type of compressor will form the main feature of the exhibit on Stand No. D 721 at the B.I.F. at Castle Bromwich this month.

These compressors incorporate the Bullows high speed valve gear, which enables the machines to operate silently and with a very high efficiency at speeds up to 1,500 r.p.m., at which speed experimental machines have been running for three years. The intercoolers and aftercoolers are of novel design, consisting of annular gilled tube heat exchangers surrounding an open discharge centrifugal fan. Due to the efficiency of these coolers the final discharge is at a temperature within 20°F. of ambient.

A range of smaller compressors will also be shown, covering industrial units, garage type units and a new petrol engine-driven set for painters and contractors and factory maintenance. Many of these engine-driven sets have also been used during the past winter for emergency compressed air supply on powerless days.

A complete range of spray painting equipment will be exhibited—spray guns, a spray booth, pressure paint containers, compressed air filters, etc.

Supplier :—**Alfred Bullows and Sons Ltd.**, Walsall, Staffs.

Forthcoming

M.O.S. AUCTION SALES

Date	*Site of Sale*	*Auctioneer*
	Miscellaneous Stores.	
May 4th to May 6th	M.O.S. Depot, Madingley Road, Cambridge.	R. C. Knight & Sons, Market Place, Stowmarket. Tel.: Stowmarket 384/5.
May 5th	Central Ordnance Depot, Old Dalby, Nr. Melton Mowbray.	Shouler & Sons, 1 and 3, Norman Street, Melton Mowbray. Tel.: Melton Mowbray 81.
May 5th to May 6th	M.O.S. Depot 127, Hallburn Aerodrome, Longtown, Carlisle.	Harrison & Hetherington, 147 Botchergate, Carlisle. Tel.: Carlisle 1792/3.
May 11th to May 12th	M.O.S. Depot 151, Wing Airfield, Aylesbury, Bucks.	W. Brown & Co., 34, Market Square, Aylesbury, Bucks. Tel.: Aylesbury 36.
May 12th to May 13th	R.A.F., M.U. No. 14, Carlisle, Cumberland.	Harrison & Hetherington, 147, Botchergate, and H. E. Winter & Son, 14/20, Lonsdale Street. Tel.: Carlisle 1792/3.
May 12th to May 14th	M.O.S. Depot 119, Test Houses, Knottingley, Nr. Pontefract, Yorks.	Bentley & Sons, Knottingley, Yorks. Tel.: Knottingley 311.
May 12th to May 14th	R.A.F., M.U. No. 72, Roade, Northampton.	Peirce, Thorpe & Marriott, 9, Bridge Street, Northampton. Tel.: Northampton 5320.
May 15th to May 25th	M.O.S. Depot 122, Burtonwood, Nr. Warrington, Lancs.	Herbert Johnson & Sons, 73, Sankey Street, Warrington. Tel.: Warrington 1689.
May 24th to May 28th	M.O.S. Depot 55, Junction Road, Weston-super-Mare.	Percy Palmer, 3, Magdala Buildings, Weston-super Mare. Tel.: Weston-super-Mare 2451/2.
May 25th to May 28th	M.O.S. Depot 98, Tower Bridge Road, London, S.E.1.	Fuller, Horsey Son & Cassell, 10, Billeter Square, E.C.3. Tel.: Royal 4861.
	Small Tools and Equipment, Testing Machines and Machine Tools.	
April 26th to May 7th	M.O.S. Depot, Yeadon, Leeds.	Oliver, Kitchen & Flynn, 30, Albion Place, Leeds, 1. Tel.: Leeds 20681/2.
May 3rd to May 7th	M.O.S. Depot 120, Test Houses, Gillbrow, Barnoldswick, Yorks.	H. W. Petty & Co., 61, Every Street, Nelson, Lancs. Tel.: Nelson 18141/5.
May 26th	M.O.S. Store, Patrick Green, Wodleford, Nr. Leeds.	Edison, Taylor & Booth, 6 High Street, Huddersfield. Tel.: Huddersfield 3177/8.
	Vehicles, etc.	
April 26th to May 7th	No. 31 V.R.D. Douglas, Lanarkshire, Scotland.	Lawrie & Symington, Lanark and Morrison & McChlery & Co., 98 Sauchiehall Street, Glasgow, C.2. Tel.: Lanark 280.
May 19th to May 25th	M.O.S. Depot, Bentley Wood, Winterslow, Salisbury.	Woolley & Wallis, Castle Street, Salisbury. Tel.: Salisbury 2491.
May 25th to June 4th.	M.O.S. Depot, Mount Farm, Dorchester, Oxon.	Simmons & Sons, 12, Station Road, Reading. Tel.: Reading 4025/6.
	Radio and Photographic Equipment.	
May 5th to May 6th	R.A.F. M.U. No. 3 Sub-site, Kingston-Bagpuize, Berks.	Adkin, Belcher & Bowen, 10 High Street, Abingdon, Berks. Tel.: Abingdon 25.
May 19th	R.A.F. M.U. No. 16 Sandon Road, Stafford.	South & Stubbs, Bank Passage, Stafford. Tel.: Stafford 82.
May 20th to May 21st	R.A.F., M.U. No. 25, Hartlebury, Kidderminster.	Nock & Joseland, Bank Buildings, Kidderminster Tel.: Kidderminster 2053.
May 27th to May 28th	R.A.F., M.U. No. 7, Quedgeley, Gloucestershire.	J. Pearce Pope & Sons, St. Aldgate Chambers, Gloucester. Tel.: Gloucester 2274.
	Miscellaneous R.A.F. Stores and Equipment.	
May 10th to May 14th	R.A.F., M.U. No. 263, Takeley, Essex.	Sworder & Sons, 15 North Street, Bishops Stortford. Tel.: Bishops Stortford 692/3.
May 13th to May 14th	R.A.F., M.U. No. 259, Peterborough, Northants.	Fox & Vergette, Priestgate, Peterborough. Tel.: Peterborough 4261.
May 25th to May 28th	R.A.F., M.U. No. 259, Sub-site, Woolfox Lodge, Greetham, Rutland.	D. N. & J. Royce, Market Street, Oakham. Tel.: Oakham 20.
May 26th to May 27th	R.A.F., M.U. No. 35 Sub-site, Bowlee, Nr. Manchester.	C. W. Provis & Sons, 2 Booth Street, Manchester 2. Tel.: Manchester CEN. 2800.
May 31st to June 4th	R.A.F., M.U. No. 255 Sub-site, Balderton, Nr. Newark, Notts.	Escritt & Barrell, Elmer House, Grantham, Lincs. Tel.: Grantham 1035/6.

Although it is anticipated that these sales will take place on the dates shewn, they should be taken as *tentative*, but the change of dates, if any, will only be a few days.

Lists of the type of stores to be included in the sales are not yet available, in the majority of cases they will be of a miscellaneous character: Electrical, Mechanical Plant and Equipment and Textiles, at each sale.

PLASTICS

Pulp Resin Mouldings by W. S. PENN, B.Sc.

Introduction.

As was explained in the article in the previous issue, there are two principal limitations to the production of large mouldings. These are the enormous pressures which would be required and the large expensive steel moulds. During moulding the pressure is required for two principal reasons, the most important being to cause the flow of the powder to the shape of the mould and the second to hold back gases formed during the curing process. The latter pressure is only very small and therefore to produce large mouldings the main requirement is to reduce the pressure required for shaping the article.

In the case of large mouldings it is usually necessary in order to obtain adequate strength to employ special impact moulding powders which require two to three times more pressure than conventional moulding powders. These moulding pressures require larger presses than would be the case if standard moulding powders were employed. The problem resolves itself therefore into so arranging the impact powder in each mould that it is unnecessary to force it to the shape of the article. In this way only a small pressure is required to effect the curing process. This somewhat difficult problem has been solved by the use of pulp resin mouldings and it is possible by this means to employ pressures of only 200 lb./sq. in.

Principle of Method.

Pulp consists of long fibres of cellulose which are admirably suitable for imparting strength to plastics. These fibres are therefore dispersed in an acqueous medium and in this form is intimately mixed with a synthetic resin dispersion. The dispersion also contains any other requisite chemicals normally found in moulding powders and this in effect is a dispersion of a moulding powder.

The next stage is to make the mould roughly to the shape of the article required from a fine gauze. The pulp resin dispersion is then drawn through this gauze so that the pulp resin mixture is deposited on the gauze. This is continued until the required thickness is built up when the felt, as the deposit is termed, is dried and removed from the gauze.

We have thus produced the moulding powder in a shape roughly conforming to the article required. When this is placed in the mould, therefore, very little pressure is required to cause any flow of the powder since it is already more or less in the required shape. In this manner pressures of only 200 lb./sq. in. are required.

Details of Method.

The first important factor is the choice of pulp. This varies principally according to the length of the fibre. The longer the fibres the stronger the resulting product so that it is preferable to choose the best types of pulp available to obtain really strong mouldings. Secondly, the most suitable type of resin must be chosen and normally speaking thermosetting types are employed and phenolic or amino plastics may be used. Normally speaking the phenolics are the most commonly employed.

To obtain the dispersion of pulp a paper beater of the type employed in the paper industry is used. This consists of a cylindrical trough divided into two channels and around which a charge of water is circulated by means of a roll. This roll is covered with a plurality of bars which, on revolving, tear the sheets of pulp and break it into the constituent fibres. The roll is gradually lowered closer to the bottom of the trough (termed the bed plate) so that the beating action becomes more effective. In this manner a 5% dispersion of the fibres is obtained. To this is added the resin, either in powder or dispersion form and the beating continued for a little while. A coagulant is then added to deposit the resin on the fibres.

This dispersion is then discharged into a storage tank where it is allowed to mature. It is then conveyed to tanks which contain the gauze moulds. During this time it is diluted to half per cent. concentration.

The pulp resin mixture by the action of a vacuum on the inside of the gauze is deposited


A MINUTE IN ONE OPERATION
This new British Dieing Press produces these intricate parts at 300 per minute in one operation and others up to 1,200 per minute, rendering several orthodox press settings unnecessary and cutting costs on production and maintenance A 25 ton model is also available Full particulars of both machines will be forwarded upon request
10 TON DIEING MACHINE
LONDON
BIRMINGHAM
EDINBURGH
E. H. Jones (MACHINE TOOLS) LTD.

in the form of a felt. This may be several inches thick since its final compression reduces its thickness by as much as 5 to 10 times. At this stage the preform, as the shaped felt is called, may be removed from the gauze whilst still wet, since it is relatively strong. It may then be given a preliminary pressing by means of bag pressure to remove superfluous water. It is then dried in a heating oven and is then ready for the curing process.

One of the big advantages of this process is *that it is possible to employ non-ferrous moulds. Either beryllium copper or zinc alloy types may be used and this makes the moulds much cheaper than if steel had been* required. It is only possible to use these metals, of course, because of the low pressures employed in the curing process so that little distortion is likely. The preform is then placed in this mould and curing by means of heat and pressure in the usual manner is effected. After curing it is only necessary to trim flash in the usual manner and the finished moulding is obtained.

Properties.

It would be of little use employing such techniques as the above unless the properties of the mouldings were as good or better than those produced by the conventional processes. In this case there is no question about it since the strength of the moulding is far superior to that obtained by conventional methods. A standard phenolic moulding usually has a tensile strength of about 8,000 lb./sq. in. and an impact strength of 0.2 ft./lb. Going a little further up the scale, a moulding made at very high pressures from impact powders has a tensile strength of about 7,000 lb./sq. in. and an impact strength of between 1.0 and 3.0 ft. lb. This, it will be seen, results in a much greater impact strength. In the case of pulp resin mouldings produced at low pressures, however, tensile strengths of the order of 12,000 lb./sq. in. are not uncommon and the impact strength rises to as much as between 6.0 and 8.0 ft. lb. Thus it will be seen that not only are large mouldings made but they are also very strong.

This particular method readily lends itself to mass production techniques. It would be useful in this connection to consider the various stages. At the pulp powder stage it is normally a batch process and a batch weight of 1,000 lb. pulp dry weight is not uncommon. However, special beaters are available to make this stage continuous. Dilution to half per cent. can be made continuous whilst special processes have been designed to make the preform stage more or less automatic. Normal curing processes are also carried out so that a large production can be achieved.

Finally, a word about costs. It might appear that in effect an extra stage is introduced but actually the manufacturers of this type of moulding virtually makes his own moulding powder by the beating stage so that this is not really an extra stage. It, in fact, reduces moulding powder costs.

It has been calculated, particularly in the *case of large moulding, that the costs are much less, the reduced cost of the mould accounting for a great deal of this saving.* In addition, the more invisible saving, such as wear and tear on moulds is also very great. Thus it is possible in the plastics industry to produce large mouldings by the use of suitable techniques.

American Vehicle Novelties

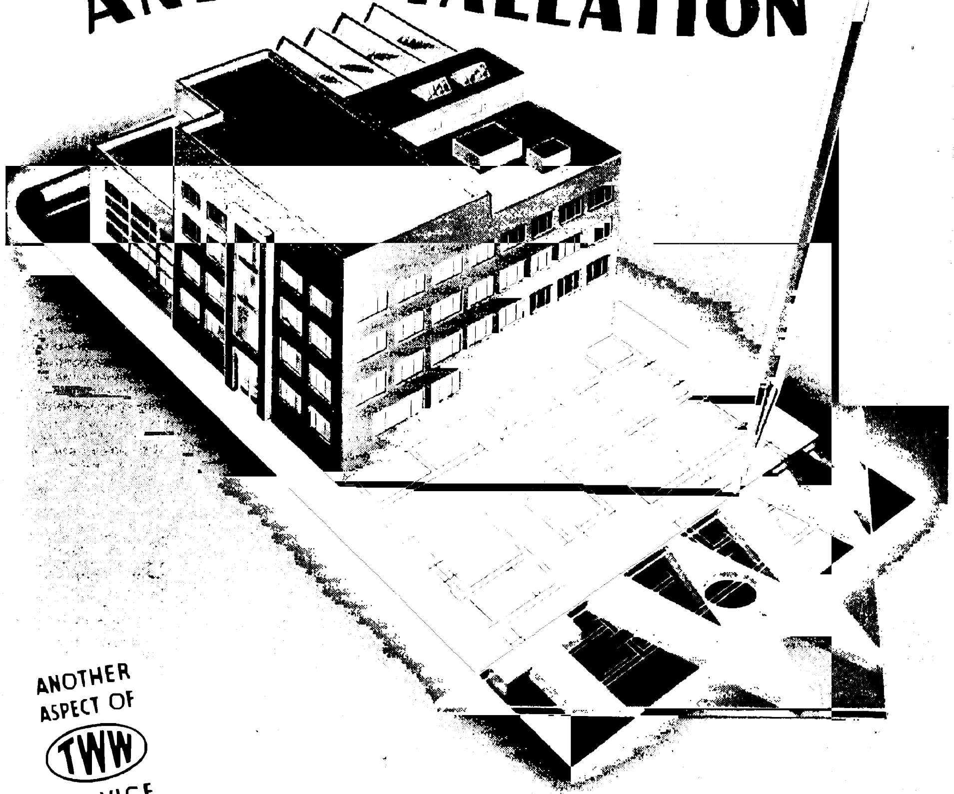
THERE is an undeniable novelty in the idea of purchasing a light car in a standard kit of parts and assembling it in one's own backyard, but the idea has been given practical form in the American produced Comet convertible.

Powered by a 4½ h.p. rear mounted motor the vehicle is a three-wheeler and can carry three people including the driver. Frame and chassis is built up of tubular steel members joined by Rose patent fittings to make a single structure. Coil springs are used in the suspension.

Among other interesting features, the body is made of tinted plastic material, and the windscreen is of Plexiglass. Weight is 175 lbs. and a consumption of 100 m.p.g. is claimed by the makers, the General Development Company of Ridgewood 27, N.Y., U.S.A. Dimensions are: length, 114 ins.; width, 48 ins.; capacity of removable storage lid, 36 sq. ins.; carrying capacity, 500 lbs.; Price c.k.d. is 320 dollars.

Two other products are included in the range marketed by the General Development Company, the Marvel delivery car, which has a capacity of 10 cwts.; (priced at 600 dollars), and a vehicle for children, the motor-wheel Featherlite. This juvenile motor-cycle is equipped with a disengageable intermediate friction-wheel and a "tube-in-one" tyre. Price is 160 dollars.

FACTORY PLANNING AND INSTALLATION



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ORDER CONTROL

"Our departmental managers are always clamouring for their work to take priority, and it is becoming clear that a suitable system of orders control will have to be devised. Would it be possible for you to get a planning practitioner to describe a successful and flexible method applicable to the maintenance department of a large plant. I am sure such an article would be well received, and while on the subject of orders it might be as well to include information which would assist the office staff of a small engineering business, as of course the two methods must differ considerably.—G.T."

The above letter is one of many we receive, in view of its possible interest to readers we give the advice of an eminent planning engineer.

In a large plant a list of maintenance code numbers should be compiled, divided into groups to cover the different classes of expense, such as capital expenditure, special revenue expenditure, change of design, external, and stores. Assuming the code number for the stores to be 60, and the order to be the first for completion on, say, February 15th, upon issue to the machine shop for spares the order would be numbered 15/2/160, signifying 15th February—1st order—stores group. Slips can then be prepared by the engineering department, and the storekeeper in triplicate, the first copy without perforation being retained, and the two perforated copies transferred to the progress office where all the orders are sectionalised. Orders requested but not yet issued should be placed in a separate section to show the amount of work to be done, and the completed orders should be taken out each day and replaced by others, the foremen reporting at the same time on the progress of each job in hand. Each order will show the estimated time to be spent on the job, also the estimated cost of materials and stores to be used, and if copies are transferred to the costing department the debits for wages and materials can be inserted and compared with the estimates.

The need for the institution of a suitable method of recording orders received by engineers whose products due for completion on any one particular day are not likely to be very numerous, lies in the fact that orders constitute the foundation for all the entries to be made in the books of account. There are several ways of booking orders, each method possessing its own peculiar advantages in individual cases according to the type of work and the nature of the product. Some engineers prefer to set down all the details on loose printed forms as a part of a slip system, and until such time as the jobs have been completed or the products delivered, these forms are retained in a folder or on a file. Upon the fulfilment of an order, the appropriate form is either placed on another file or bound with other fulfilled orders in book form to constitute a kind of order book and sales book combined. Loose forms of one kind or another are to-day a practical necessity in any engineer's office, but as applied to orders they carry certain disadvantages. Some of the order forms, for example, get filed away before all the instructions have been carried out, or before the full charging prices have been entered in the ledger, and this danger may be avoided by the use of a duplicate book consisting of thin tissue leaves, the orders being then written out on the pen or pencil carbon-copy principle, a separate sheet being used for each distinct order. In such cases, the original form can be handed to the person or transferred to the department immediately concerned in the execution of the particular order, while the carbon copy is retained in the book for office use and for purposes of future reference. As soon as a job has been completed, both the original sheet and the copy may be cancelled, and if a money column is ruled down the right-hand margin of the duplicate book the charging price can be inserted and posted direct to the debit side of the personal account.

While the use of loose forms or sheets may reduce the volume of clerical work to some extent, by far the most satisfactory method of booking orders received consists of recording the details in a separate bound book kept for the purpose. Although not an account book

and outside the scope of the debit and credit principle, such a book should be kept neatly and up to date, and will contain a mass of vital information, and to avoid the possibility of obligations or arrangements being overlooked a number of separate columns or sections should be provided. The instructions received from agents usually state that no responsibility will be accepted for products delivered that are not in strict conformity with those actually specified, and usually contain a request that the number of the order be quoted on the invoice and other documents, consequently the date on which each order came to hand, the number, and the name and address of the customer or agent should be shown in the order book, together with a full description of the products required or the work to be done. A separate column or section will be needed for inserting the rate or price at which the job is to be put in hand, and later on, when all the instructions have been carried out, the date of completion or supply will have to be entered. A good general ruling for the book, capable of modification to satisfy any requirement, is given in the attached specimen.

Directly an order is received, the first five columns can be filled in without delay, and if there are any unusual conditions or stipulation a reference to these may be made in the "Remarks" column. In the majority of instances the details shown in the column headed "Products Delivered or Requirements Fulfilled" will correspond with those shown under "Products or Requirements," but in order to provide for modifications and alterations to specifications the two columns are essential and should be filled in as a matter of routine. As numerous references will have to be made from time to time to the particulars recorded, an effort should be made to simplify matters. For example, as time goes on, many pages will contain orders all of which have been completed, and by ruling a line diagonally across such pages from corner to corner a considerable amount of time and labour will be saved. Care will have to be exercised, however, to ensure that no page is marked off in this way until all the orders show a number in the "Ledger Folio" column. The remainder will, of course, constitute the unfulfilled orders to which the personal attention of the engineer should be constantly directed, all instructions that appear to have been outstanding for an unduly long time being investigated to avoid any being left only partially fulfulled.

ENGINEER'S ORDER BOOK

Date	No.	Name, etc.	Products or Requirements	Rate or Price	Date of Completion	Products Delivered or Requirements Fulfilled	Date due out	Ledger Folio	Remarks

Continued from page 47.

[illegible]

Stoke. Almost four-fifths of the goods they manufacture are for world export markets, mostly for dollar and hard currency markets, although a large business is done with the Dominions and Colonies.

One of the world's principal pottery firms is situated in Burslem, that of the Royal Doulton Pottery, where the most luxurious china has been made. This concern is famous throughout the world for the superb quality of its products. For export markets—most of their output goes overseas—table ware in bone china is decorated in styles ranging from the highly ornate to the austerely restrained. In ornamental pottery Doulton's have attained a standard described as the highest possible in each particular style. Reviving the traditional methods of the Chinese, splendid examples of Sung, Chang and Flambe ware are made, with effects surpassing even those of the master craftsmen of the originals. Recent developments include the production of figures, while the modern Toby jugs are much wanted.

Overseas pottery buying is mostly in decorated ware, and in this connection it is interesting to note that while some of the older traditional patterns are still firm favourites, new styles in both shape and ornamentation are resulting from experiments made by resident artists employed by the larger concerns. The amount of hand-painted work, often signed by the artists, is naturally limited. Throughout the history of English pottery making there have been master craftsmen in artistic decoration—artists equal to others working in different mediums. While new factories have been erected, with new types of machinery superseding some of the old hand methods, none of the potteries has in any way permitted its standards of production to diminish, which is probably one of the reasons why British china is in such demand overseas.

What has been said of the potteries mentioned by name is in the main equally true of other and smaller concerns. Indeed, potting has always been more of an individual craft than many industries, for machinery, though now used extensively, has not been able to oust the master craftsman, and on the decorative side the human element is as necessary as ever. Standard mass produced articles are bought by overseas customers mainly for everyday use. All first-grade bone china is going overseas, only sub-standard pieces coming on the home market. The position might alter materially were the individual potteries able to secure more labour. However, pottery firms are producing the maximum possible output that the present shortage of operatives permits, and very large quantities of china and earthenware are being exported, for nowhere in the world is pottery of superior quality to that produced in this country made. Judging by the state of order books in the Stoke-on-Trent district foreign and Colonial buyers are well aware of this. Potteries would like to give better delivery dates, but in an industry so dependent upon the human element production cannot be speeded up at the expense of quality, which no pottery will consent to do. Nothing but the very finest is the standard by which the large and small firms of the Potteries measure their products for export.

PLANNED MAINTENANCE

Preventive maintenance consists of doing all the fiddling jobs regularly, doing them thoroughly and not forgetting to do any of them. So says our contributor Mr. H. M. Harman in this article. He makes a series of criticisms of present practices and gives some suggestions.

In order to prevent breakdown of plant and machine tools it is essential that a periodic check up be made of all important and unimportant details.

This check must be carried out at stipulated periods and not just when the maintenance men can find time. After all you don't let your car engine sump run dry before putting in new oil. You don't let your battery run dry before topping up. Or do you ?

It should be realised that a machine tool is an expensive piece of equipment. Just because the boss owns it and must stand the loss of non-productive hours and repairs that does not relieve all concerned of the responsibility of seeing that the machine is used properly and maintained in good order. A machine tool out of use means a man out of work, less production, fewer sales, less export, less money coming into the country and consequently a longer time must elapse before we can get back to pre-war normality.

So you see how important it is to put that oil in the right place at the right time, to replace that worn belt before it breaks and injures somebody, to make sure that the motor is clean and not choked with dust. Little things you say. Yes ! but just as important as the glass for our beer—one's no good without the other.

The writer has seen the effects of inadequate lubrication of machine tools, no doubt you have too, but did you profit by the experience ?

Routine jobs.

It is not proposed to tell the reader how to operate a grease gun but stress will be laid on where, why and when.

All machine tool manufacturers of repute will supply handbooks and charts showing lubrication points, type of oil or grease recommended and most important—how often to use it.

If a new piece of equipment arrives at the works and no chart is available then why not get the junior plant draughtsman to make one. It will only take an hour or so . It will cost less than twenty shillings and that pound will be saved on the first overhaul.

Having obtained or made your oil chart check up to see that all points are covered. It is a regrettable fact that most pieces of machinery (including cars, bicycles and prams) leave the makers' works without anywhere near sufficient lubrication points.

If you find a bearing, toggle joint or slide which has no oiler or grease nipple it will not take long to fit one. When you've done it write to the makers and tell them. Posterity or the next buyer will thank you.

Right ! We have all the oilers and grease guns and the will to go. The next thing is to prepare a colour scheme for your lubricants. Most oil companies have cut and dried schemes in existence. Why not use one and save yourself the trouble of going over the ground again.

To paint the grease nipples, guns and storage containers blue or pink for a particular grease is the work of a few moments and it saves the oiler having to work it out each time.

A record card should be available for each machine. This can be kept with the machine or in the plant office. It indicates the approximate dates when oiling and greasing should take place and a mark is entered when the job is done.

All this is very simple providing that the plant engineer is sufficiently enthusiastic to see that it is carried out.

So much for oiling. Belt maintenance is a one man job. Appoint a man who will take the trouble to appreciate the advantage of one type of flat belt over another for any specific job. Fix him up with a bench in the middle of the shop and let him go through the machines systematically. Any suspected flat belts can then be removed and patched or replaced before they break and worn vee belts can be renewed before slipping occurs. When

dealing with vee belts it should be remembered that a drive with say four ropes is an integral unit. Two pulleys and four ropes. If one rope wears then they must all be changed. Remove the old ones and scrap them, don't hoard used vee belts, they are never satisfactory if used again. If they are not worn they will be stretched and will not mate up with new ones.

Another important function of the routine maintenance squad is the checking of bearings and slides for wear. If worn parts are replaced early the consequent wear on other parts will be avoided. For instance one slack bearing will set up vibrations in the machine which will cause unnecessary wear on other bearing surfaces.

This sort of thing is most apparent on grinders. It makes itself evident by the appearance of multitudinous flats on the finished surface.

Worn lead and feed screws are another item which should be watched closely as accurate work cannot be carried out on a machine whose table moves just at the wrong moment.

It is quite easy to keep a rough check on the number of hours worked by your machines. The responsibility can be vested in the production chargehand who can fill out a sheet showing the approximate number of hours worked by each machine during the week. This information can be collected and recorded by the Works Engineers Department and if properly charted it will form an excellent guide as to the advisability of giving a machine a general overhaul.

Before commencing the system an approximation must be arrived at for assessing the number of working hours between overhauls. This will vary with each type of machine. For instance, a planing machine might be expected to carry out 10,000 hours of work before being stripped for inspection and repair, but a grinding machine would need to be attended to every 2/3,000 hours.

The foregoing is an attempt to obviate mechanical breakdown. The electrical side is equally important. Electric motors will probably form the major item under this category and in this connection the following points should be noted.

Check for wear in bearings. Play in shaft or noise will indicate if bearings are in need of attention through worn or broken parts. Alternatively periodic checks can be made with long feelers between the stator and the rotor. This will indicate if the rotor is running centrally. Since the clearance may be only a few "thou." then bearings must be renewed before this clearance is taken up and the rotor starts to rub on the stator.

As with the mechanical equipment lubrication at stated periods, say every three months, should be carried out.

Belts which are too tight will cause uneven pressure on motor bearings with consequent increased wear, watch this. Overheating due to lack of oil or excessive pressure may be checked with the hand. Rectification without delay is advisable. Overheating in the windings may be checked by placing the hand in front of the ventilation openings. A strong hot blast will probably indicate overload while a feeble wind may indicate restricted ventilation. Watch for over-heating of short-period-rated-motors. Operators have a nasty habit of leaving these running continuously, especially on small double-ended grinders and finishers.

Keep oil away from the motor windings, it is a great enemy of insulation and it may be absorbed to such an extent that the insulation breaks down and a short occurs. Check the insulation resistance of a motor every three months by means of a megger. Keep a record of the figures for comparison purposes. Brushes will require to be renewed periodically but well cared for slip rings should last the life of the motor. Neglected sliprings will burn and require skimming or if they have gone too far may have to be renewed altogether.

Preventative Maintenance.

Much of this is covered in the preceding paragraphs but such items as services should receive the same attention as the machinery.

A £2,000 machine tool is so much locked up capital if the supply mains break down. Busbar systems for supplying electrical power are now the accepted practice in modern machine shops and they give very little trouble, but control panels will require regular servicing.

Points to watch when carrying out routine inspection of electrical equipment are:—Ensure that panel is clean and free from dust, see that corrosion has not affected the working or static parts, check contacts for cleanliness and burning, check that overload trips are correctly set, put clean oil in oil immersed starters as soon as the old oil becomes dirty, check that terminals and panel mountings are tight. Any unsatisfactory items can be rectified by the person carrying out the inspection or they can be recorded and put right by the maintenance electrician.

Compressed air mains are the cause of a lot of maintenance work. Therefore when pipes are installed see that the job is done properly. Ensure that all pipe screwing dies are sharp

and that good clean threads are formed. This will go a long way towards eliminating leaks at a later date.

Rubber hose should be strong and well jointed. Use clips such as the "Jubilee" type for attaching hose to fittings, never use wire, besides being unsightly it can be very dangerous. Once a week have your pipefitter go through the shops after the plant has closed down. Leave the compressor running. Only in this way will he be able to detect air leaks. He will never hear them during the working shift.

Air costs money. It is perhaps the most expensive service which you will have to maintain and it is so easily wasted. The moral is obvious. See that your pipefitter does his job.

Gas leaks are dangerous as well as costly but they are usually apparent by the smell. The same man can deal with these.

Records.

If the factory is large, records must be kept of routine maintenance. With a plant staff of say 150 people it is impossible for everything to be kept in the head.

Record the dates on which a machine is serviced, cleaned or painted. In two or three years time you will have accumulated information which is absolutely invaluable. You will know in advance just when to expect trouble and more important you will know when to go out looking for it.

by A. J. Speakman

"*Where the application of scientific methods of production can be proved to be of advantage not only in the rebuilding of our export trade, but also to industry generally and to the workers employed, in the opinion of the committee, they should be welcomed.*"

The significance of the foregoing extract from the 48th annual report of the Management Committee of the General Federation of Trade Unions cannot be over-emphasised as it shows an attitude of mind anxious to examine new methods of approach to production problems which, had they been proposed a generation ago, might have been met with suspicion.

In parallel with this changed attitude is the managerial revolution the tempo of which has increased enormously since the end of the war. The board of directors is fast replacing the tradition of father-and-son in the management of our industries. Likewise, all grades of management are being recruited to an increasing degree on the merit of technical background and practical experience so that the function of management is now split up into specialist categories which dovetail together to form the complete "picture." Because this "revolution" has been progressive and continuous during the past 30 years, the implications have not been fully appreciated. The relationship between Management and Worker is no longer one of "we" and "they" but of "us." It is vitally important that this fact be recognised now in all our trade negotiations as otherwise British Industry may well go down in a welter of internecine strife. In short, there must be a unanimity of purpose in tackling the fundamental causes of production inefficiency in the full knowledge that the actual wealth of the nation is what it takes from the ground in the form of crops and materials plus the value added to these products by processes of manufacture. The key to our industrial recovery, therefore, lies in the fact that we must nationalise processes of manufacture by cutting out all redundant operations and, by minimising the human effort involved, reduce the man hours and cost.

To the majority of readers, the above statements must appear platitudinous for most people are becoming heartily sick of their reiteration in the press and on the radio. Nevertheless, time is running out and the problem of production, which can be defined as a "crisis within a crisis," remains. The sellers market is beginning to shrink at home and, in some export lines, has vanished altogether.

In the past, when profits were endangered, industry adopted one of three courses. Either the price to the consumer was raised, wages were cut, or the shock was "cushioned" by increased efficiency of production. In only

a minority of industries did the last course appear necessary to those concerned with their management !

However, circumstances have changed and with the advent of labour as an effective factor in Management, production efficiency has become a joint responsibility. Industry is beginning to recognise the fact that if the "statuesque" of improved wages and working conditions is to be maintained in the face of increasing foreign competition then economies must replace politics as the basis for discussion.

There is a lot of loose talk at the present time on the question of incentives as the panacea for all our troubles, and in this connection it is opportune to sound a warning note, for a bad incentive scheme is far worse than none at all. This is not because there is something inherently wrong in the conception of incentives, but because those who have operated the majority of incentive schemes have not always worked out what are the basic conditions which can make such systems effective in operation. The most efficient process and the best layout are the pre-requisites in the application of any incentive scheme.

The fact is that we are only just beginning to understand productivity, to measure differences, and erase their causes. The application of incentives may increase production but the root causes of production inefficiency will remain.

Alternatively, many people are turning to the Management Consultant in the hope that he may be able to help. He may, but he can only work within limitations. Efficiency cannot be bought for it is an attitude of mind. A Management Consultant can only advise on the things which he sees during the course of his investigation. Admittedly, he is the trained observer and usually knows where to look, but again, he can only pick out the "high spots." Because of this he will probably point out problems and solutions which have been self apparent all the time because it was no one persons' job, within the firm, to work for them.

Just as problems arise on the shop floor, so also can they usually be solved at that level, for no one knows the snags quite as well as the man doing the job. The trouble is that until now neither the worker nor the management have looked upon it as his functions to suggest improvements. As the majority of industries guard their processes jealously, they hesitate to bring in an outside opinion and many problems are thus perpetuated.

It has not always been recognised that working must include *thinking* and the Ministry of Labour have appreciated this fact in the Training Within Industry (T.W.I.) scheme under which, up to the middle of October, no fewer than 31,073 supervisors had received instruction in Job Relations and the number attending groups each week on all programmes was 1,200 in December. Whilst 1,282 concerns have adopted the scheme, it only shows how much remains to be done if T.W.I. is to become part of the ethics of industrial management.

In parallel with this there is a fresh drive for the establishment of joint consultation between management and workpeople which is part of the original Whitley conception that it is not enough to secure co-operation as between various industries, but that it is necessary to enlist the practical support of all levels of personnel in individual firms.

During the war Joint Production Committees were established over an extensive industrial field and made a tremendous contribution towards the common effort. Though a minority of firms accepted them on sufferance in the initial stages, the majority of concerns willingly accepted them as co-partners in the production effort as their members represented every phase of factory life. Because of this, a wide range of interests was brought to bear on problems which no one individual could have hoped to solve.

Moreover, as the machinery of joint consultation is entirely voluntary and advisory and does not deal with questions relating to remuneration, the members are able to concentrate on actual production problems.

It is infinitely better to encourage employees to share the responsibilities—and headaches—of Management than to seek advice outside. The same advice which has to be bought outside is often given within the firm.

This article is not intended to be critical of Management Consultants but rather to point out their limitations within the actual field of production. Every employee in every firm throughout the country is a potential consultant on his own particular job for everyone possesses some natural instinct of craftmanship, pride of accomplishment, and is moved by some inward ambition. From such sources does all initiative and enthusiasm spring. The co-ordination of these psychological factors is the function of efficient Management.

With this new partnership vast new fields of production problems could soon be explored and we should get again a new mental adjustment of the mass of the workers towards their new found responsibilities.

PERSONALITIES

Mr. Paul Reilly has assumed charge of promotion and publicity as Public Relations Officer with the Council of Industrial Design. Mr. Reilly, who before the war held the position of acting Features Editor with the *News Chronicle*, recently completed a six months survey of the American plastics industry on behalf of the National Trade Press. He joined that organisation in 1946 as Plastics Editor.

Dr. Morris Reed, Ph.D., M.Sc., M.I.E.E., has been appointed Chief Radio Engineer of Philips' Mitcham works. Dr. Reed has the advantage of wide experience in the radio, television and allied industries. beginning with his connection with the International Standard Electric Corporation as telephone engineer. This position was followed by seventeen years with Siemens Brothers as head of the wireless laboratory, Chief Radio Engineer, and Assistant to Chief Engineer, Telecommunications Department. More recently Dr. Reed was General Manager of R.F. Equipment, Ltd.

Mr. W. H. Edwardes, who undertook the work of service superintendent at the Kingston Branch of Leyland Motors Ltd. during the war, is returning to the company's sales department. **Mr. A. L. T. Baker,** at present in charge of assembly and overhauls at Kingston, has been appointed to the position of service superintendent at Leyland's Kingston works.

Mr. H. A. Lingard, Director of Lamps and Lighting Sales and a member of the Boards of The British Thomson-Houston Company Ltd., and other companies, is shortly to retire from active service owing to ill-health. He joined the BTH Co. Ltd., in 1904. In 1928 he became General Manager of the Lamps and Lighting Department and three years later he became a director of the Company.

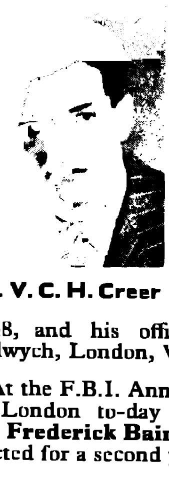
Mr. H. A. Lingard

Mr. O. W. Murray is the chief mechanical engineer, and **Mr. R. Adams** the chief civil engineer in the new central engineering department of Monsanto Chemicals Ltd. **Mr. J. M. Kershaw,** assistant to the manager of engineering, will continue to act as chief construction engineer at the company's factory at Newport.

Mr. Robert Dodd has retired as technical director of Erinoid Ltd. after serving over twenty years in this capacity.

Sir Graham Cunningham, chairman and Managing Director of Triplex Safety Glass Co., Ltd., and Chairman of Alliance Property Co., Ltd., has been appointed by the Minister of Supply to the Chairmanship of the committee to enquire into scrap and pig iron supplies. The committee will benefit from Sir Graham's considerable experience in dealing with supply problems ; during the war he was Chief Executive and Controller-General of Munitions Production under the Ministry of Supply. He has since become Chairman of the Shipbuilding Advisory Committee ; and has served on the Economic Planning Board.

Mr. Victor C. H. Creer, M.A. (Cantab.) has been appointed to the Board of Directors of The British Thomson-Houston Company Ltd. He joined the Lamp and Lighting Department of the British Thomson-Houston Company, Ltd., in 1945 as assistant to Mr. H. A. Lingard and was appointed General Manager of the Department in June, 1947. Mr. Creer takes his place on the Board with effect from May 1st, 1948, and his office is in Crown House, Aldwych, London, W.C.2.



Mr. V. C. H. Creer

At the F.B.I. Annual General Meeting held in London to-day (Wednesday, April 14), **Sir Frederick Bain, M.C.,** was unanimously elected for a second year of office as President.

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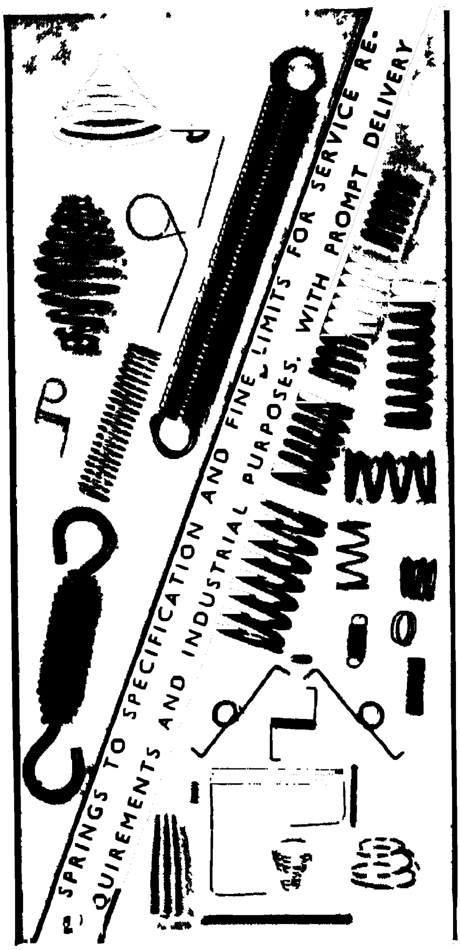

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BRAILEY ELECTROPLATERS LTD.
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IN
ALUMINIUM-
BRASS-ZINC
ALLOYS

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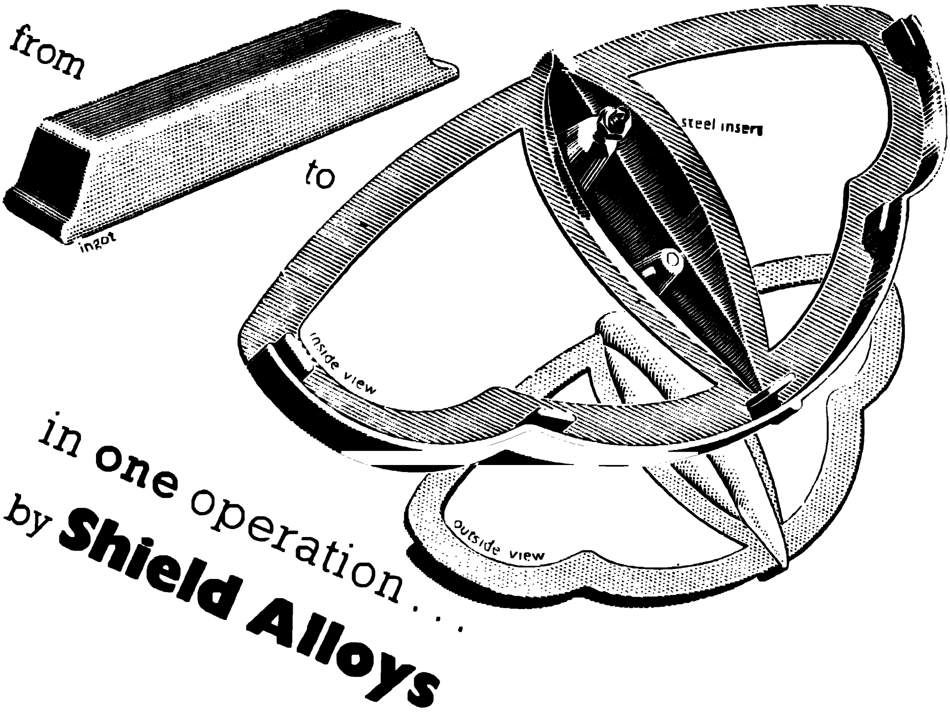

Shield Alloys Ltd. Brook Street, Tring, Herts. *Telephone* Tring 3338-9, 3381-2

1015 14 cwt. capacity.

"EZIWHEEL"

Trucks and Trailers

are made in a large variety of designs and include hand and trailer models up to 4 tons capacity.

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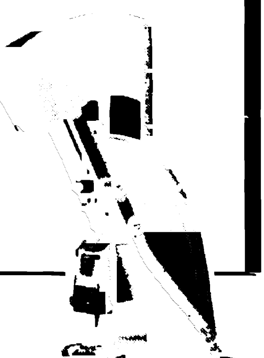
In need of a small press for producing small precision parts with a high degree of accuracy and a minimum of operator fatigue we designed the "STANELCO" Single-action Bench Toggle Press for use in our own factories It is now being used by a vast number of satisfied customers We can usually quote prompt delivery

STANELCO

SINGLE ACTION

TOGGLE PRESS



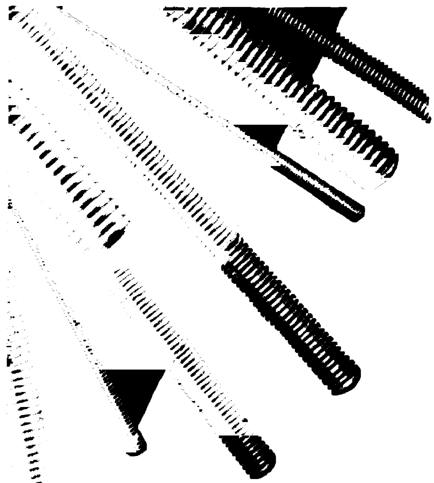
LT Model
Weight 130lbs
Max Stroke 1 1/8
Size of table 6 x 8
Overall height 34

LM Model
Weight 80lbs
Max Stroke 1
Size of table 7 x 5
Overall height 23

Standard Telephones and Cables Limited

(Industrial Supplies Division)

Cline Road, Bounds Green, London, N.11



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All Diameters, All Lengths, All Metals in Whitworth, BSF, BA, SAE, Metric and Special Threads

Export orders accepted

Large Stocks **PROMPT DELIVERIES**

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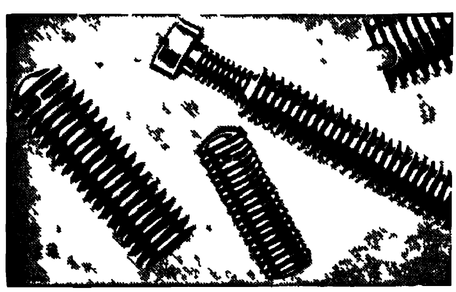
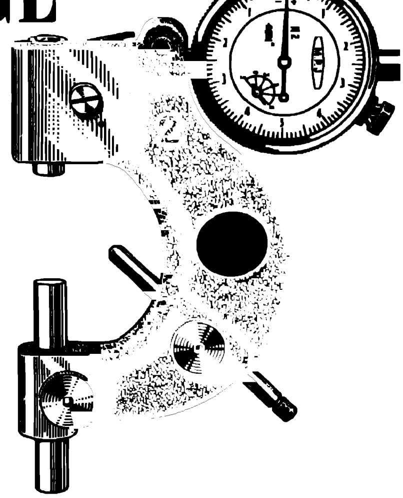


9311

DIAL SNAP GAUGE
Model 'D'



This Gauge has been designed for quick and accurate inspection of cylindrical workpieces. May be set to a cylindrical master, plug gauge or slips.

Eight models are available covering a range from 0 to 12" having indicator readings in either .001" .0005", .0001" or metric.

May we send you Leaflet giving full particulars?

"Member of the Gauge & Toolmakers' Association"

M.P.J. GAUGE & TOOL CO. LTD. ERDINGTON. BIRMINGHAM. 24

We serve again!

Tyres . . . . Sponges
Floor Coverings
Mattresses, Upholstery
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In limited numbers now but in ever increasing quantities as raw material restrictions diminish

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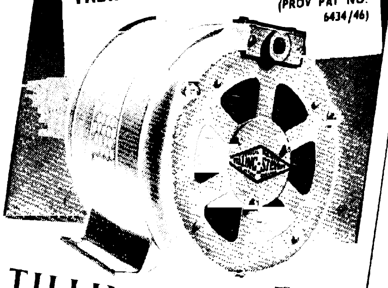
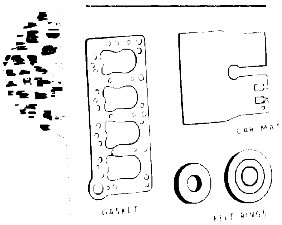
FABRICATED I.H.P. (E.V.) MOTOR
(PROV PAT NO. 6434/46)

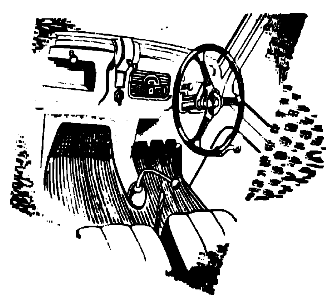


TILLING-STEVENS
LIMITED
Head Office and Works
MAIDSTONE, KENT, ENGLAND

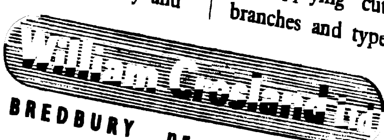
UNIVERSAL TOOLS LTD. TRAMWAY PATH, MITCHAM, SURREY

CROSLAND CUTTING DIES





For cutting sheet materials of all kinds in simple or the most complicated ways, the right cutting dies are essential to full efficiency and speed. Let Croslands give you the benefit of their long experience in supplying cutting dies to all branches and types of industry.



BREDBURY nr. STOCKPORT.

INDEX TO ADVERTISERS

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Avail yourself of new ideas and enquire for further details.

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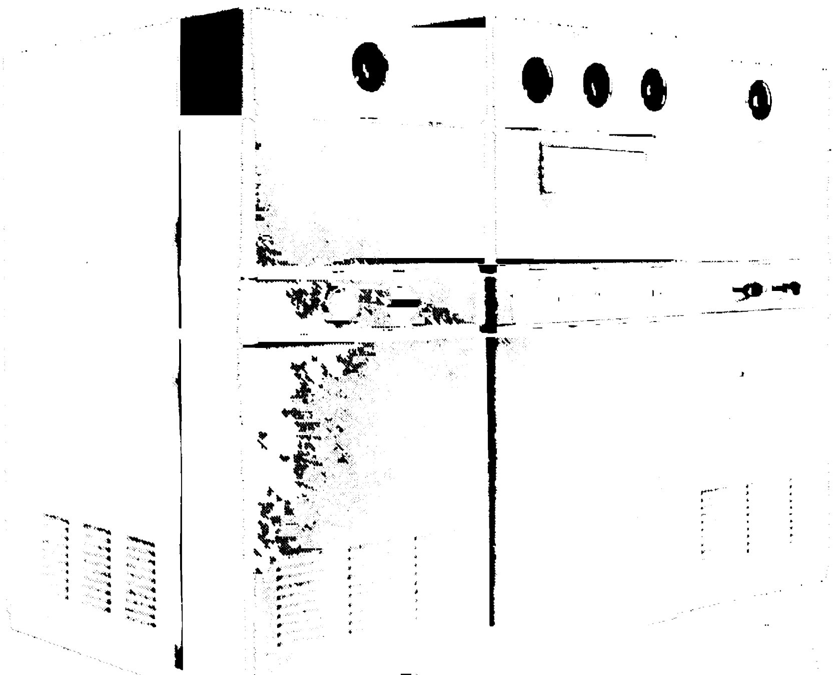
High frequency

heating is the



High frequency induction heating is the answer to many heat treatment problems Correctly applied it provides increased production at reduced cost particularly of mass produced parts requiring accurate control The Philips Electronic-Heating Advisory Service invites your enquiries Write to Dept G at the address below

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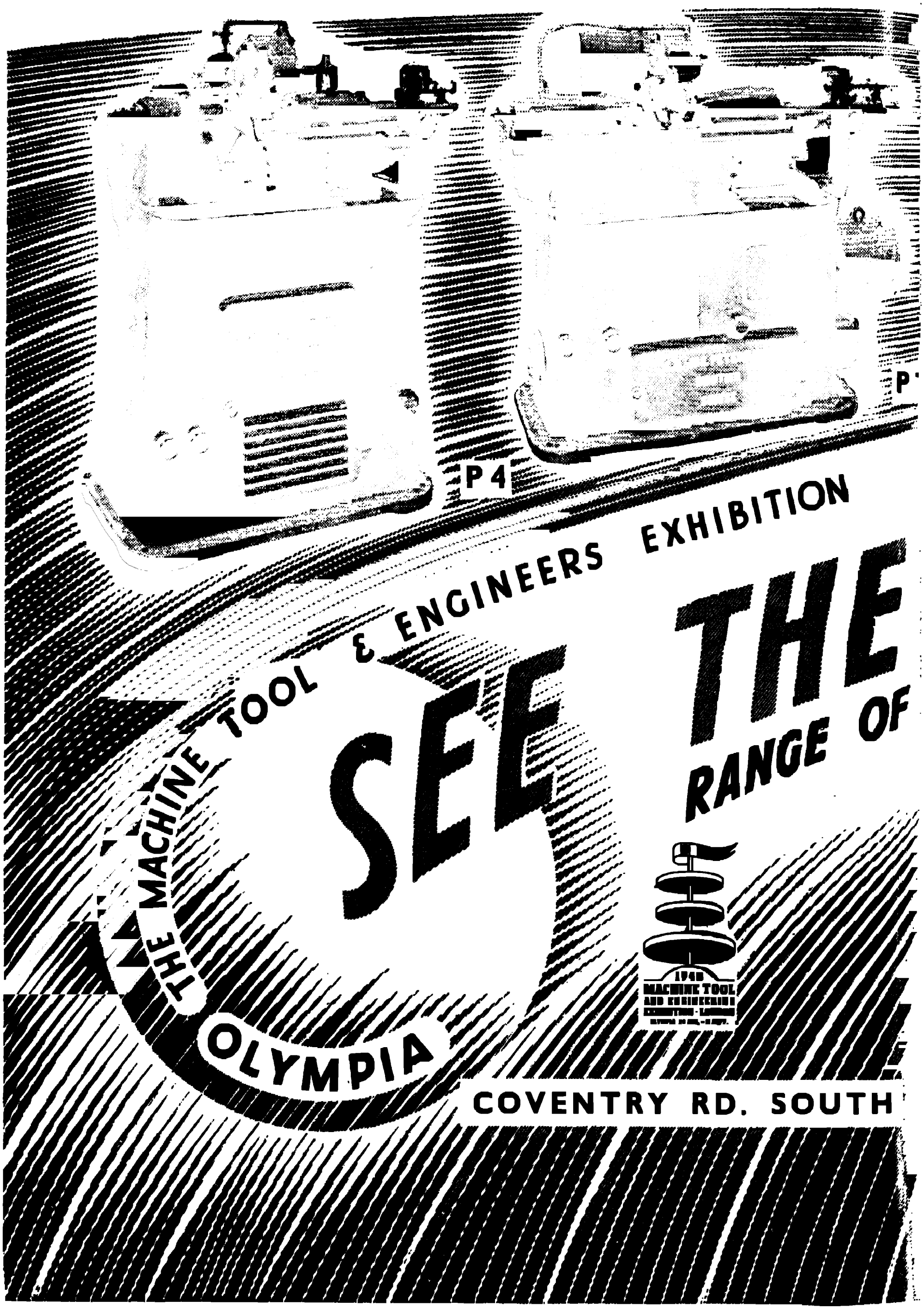

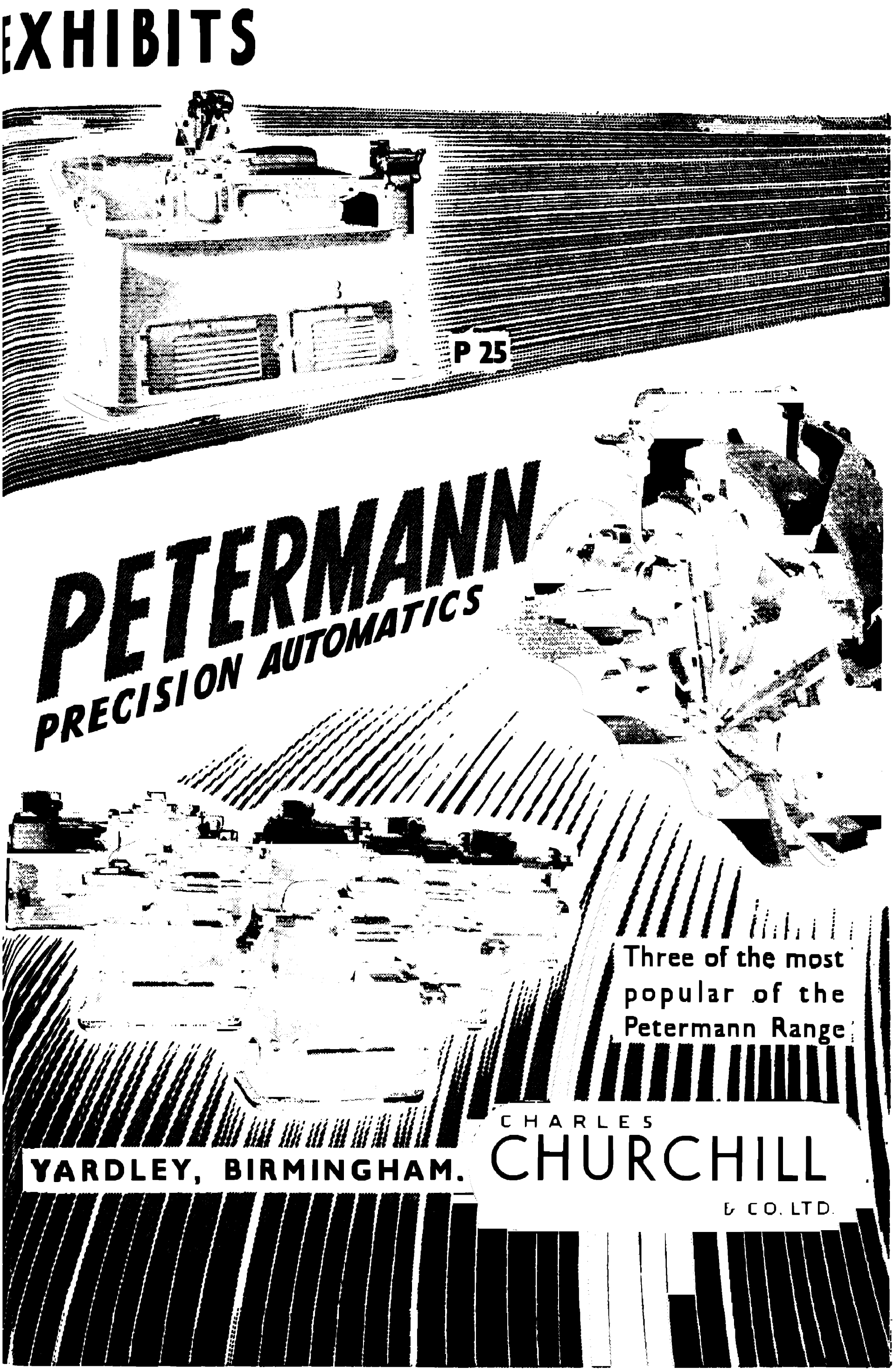

EXHIBITS
P 25
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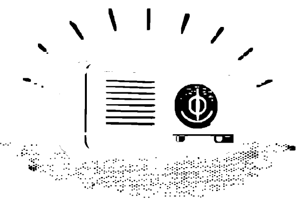
PRECISION AUTOMATICS
Three of the most popular of the Petermann Range
CHARLES CHURCHILL & CO. LTD.
YARDLEY, BIRMINGHAM.



We flopped on this one

(at first!)

I don't think you can do it, he said, which of course is a sure way of starting something at Ashdowns. Our customer was talking about his radio cabinet. It was a single moulded two-colour job. The fret was to be sprayed cream and it would have to be good. It would have to face a mighty tough test.

I only know one man who could do that job our customer said, but he's not in the Country. That clinched it. We got to work. Our first go was a flop and our faces were red but we set to again. Success.

Okay, our customer said, you win, and as a reward for enterprise I'll tell you this is a better job than the fellow who's not in this Country would have done.

If you want to know about plastics ask **Ashdowns**

In addition to making mouldings, we have a special department for fabricating " PERSPEX ", and we make "ASHLAM" electrical insulation boards which, incidentally, are exceedingly good.

ASHDOWNS LTD., ECCLESTON WORKS, ST. HELENS, PHONE: ST. HELENS 3206

"ASHLAM" is the registered trade mark of Ashdowns Ltd. "PERSPEX" is the registered trade mark of the I.C.I. Ltd.

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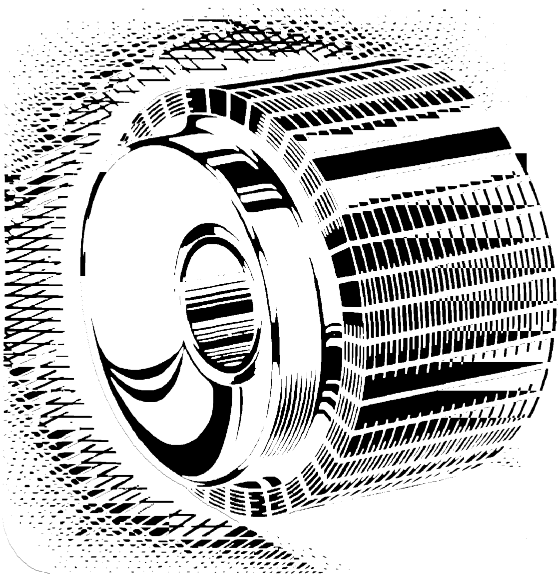
NEW HOOVER PLASTIC COMMUTATOR

(As used in all Hoover Cleaners)

IS NOW AVAILABLE TO THE ELECTRICAL INDUSTRY



Lower cost—Increased life.

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Simplified design to assist easy and rapid assembly.

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No steel core; no packing necessary; no bent or twisted wires.

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Rustproof and proof against moisture seepage.

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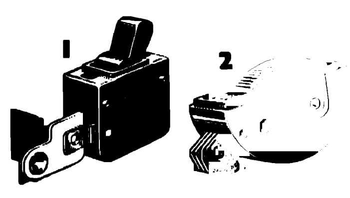
Longer tracking distance to earth.

In the new Hoover Commutator, copper bars and brass bushes are bedded in tough, high-grade plastic and sealed rigidly into position under high pressure and heat. The result is a Commutator of remarkable stability, capable of maintaining extreme accuracy of alignment, even when subjected to high speed tests up to 30,000 r.p.m. The risk of bar lift or staggering is thereby reduced to the merest fraction. Over 1,000,000 of these plastic Commutators have been used in Hoover Models or have been supplied under Government contracts.

For fuller specifications and trade quotations write to:

HOOVER LTD

HOOVER SWITCHES ARE ALSO AVAILABLE



1 Toggle Switch 2 Slide Switch

These small compact switches, as used in all Hoover models, are specially made to withstand constant daily usage. They can be supplied in any quantity at competitive prices. The Toggle Switch is provided with a wiper arm to ensure a clean contact.

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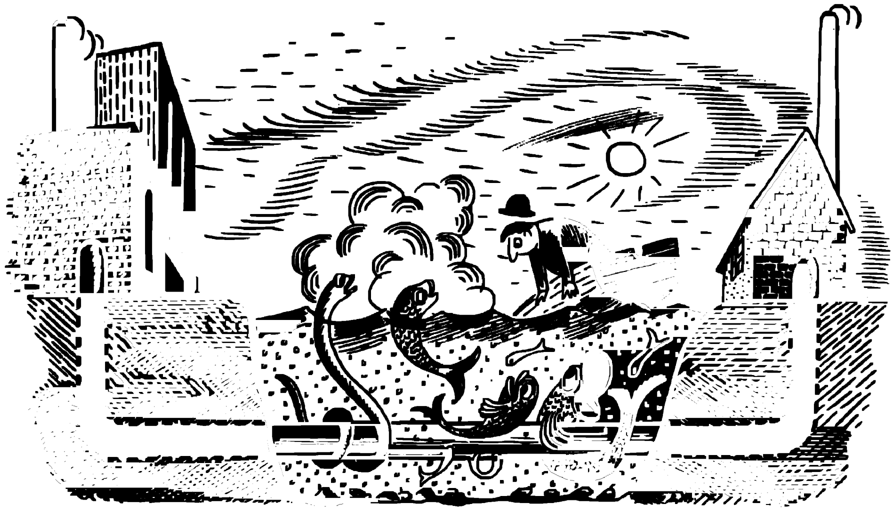

A well-built condensate return system, but only the fish got the benefit!

The management of a certain works went to great trouble to install a condensate return system, but were discouraged to find that they were still getting cold water to feed their boilers. The Ministry's Fuel Engineer, who happened to hear of their difficulty, discovered that the return main passed through a river on its way back to the boiler house. The result was a fine central heating plant for the local fish and an equally effective cooling system for the condensate which they had taken such care to collect.

THIS WOULDN'T HAPPEN TO YOU! Of *course* not. But it did happen to someone! And this is no isolated instance of the obvious being overlooked. We all have our blind spots, and however familiar we are with an installation or a process, we are liable to pass over bad or out-dated practices that a fresh pair of eyes would spot in a moment.

Wouldn't you be wise to ask the Ministry's Fuel Engineer to pay you a visit—just in case? Not only is he rich in practical experience, but he can look at the job from a fresh point of view.

By the way, have you referred to "The Efficient Use of Steam" by Oliver Lyle? It can be ordered through any bookseller (866 pp., 15/- net), or obtained from H.M. Stationery Office, 15/9 post free.

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Northern	Government Buildings, Ponteland Road, Newcastle-on-Tyne, 5	Newcastle 28131
North-Eastern	Century House, South Parade, Leeds, 1	Leeds 30611
North-Midland	Castle Gate House, Castle Gate, Nottingham	Nottingham 46216
Eastern	Shaftesbury Road, Brooklands Avenue, Cambridge	Cambridge 56268
London	Mill House, 87/89, Shaftesbury Avenue, W.1	Gerrard 9700
South-Eastern	95, High Street, Rochester	Chatham 3487
Southern	Whiteknights, Earley, Reading	Reading 61491
Wales	27, Newport Road, Cardiff	Cardiff 9234
South-Western	12/14, Apsley Road, Clifton, Bristol, 8	Bristol 38223
Midland	Temporary Office Buildings, Hagley Road West, Birmingham, 17	Bearwood 3071
North-Western	Burton Road, West Didsbury, Manchester, 20	Didsbury 5180-4
Scotland	145, St. Vincent Street, Glasgow, C.2	Glasgow City 7636
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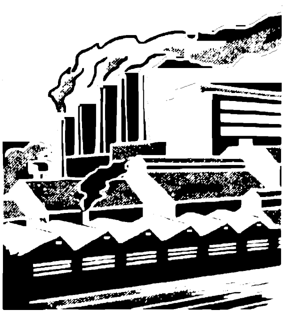
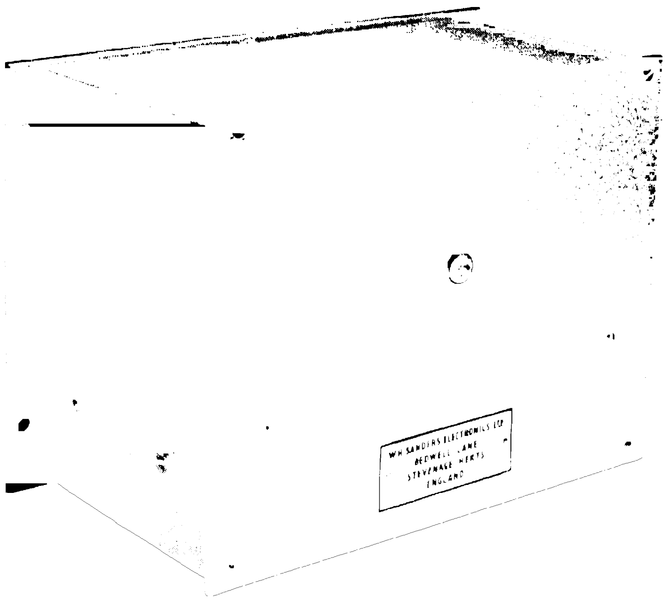
ISSUED BY THE MINISTRY OF FUEL AND POWER



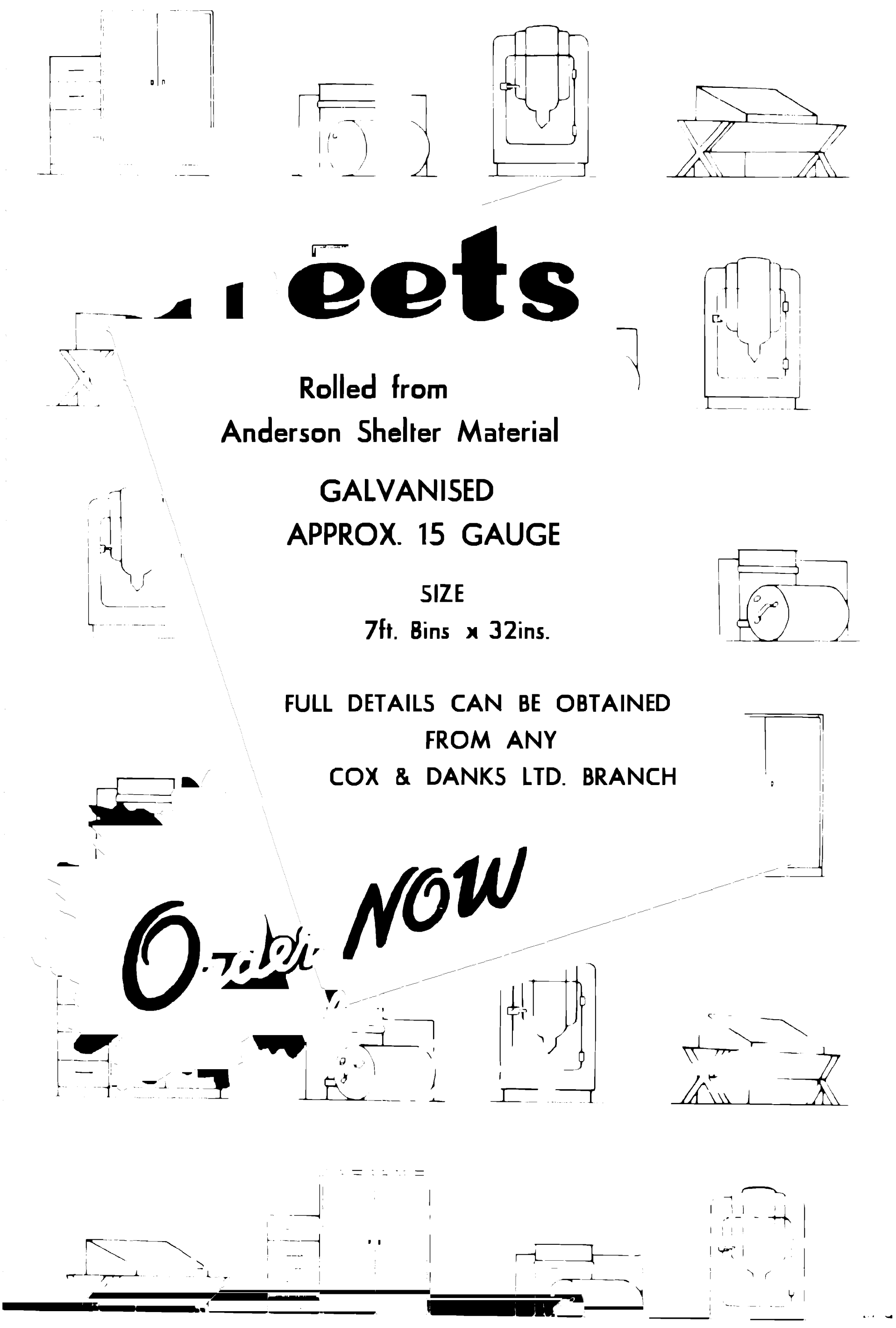
INDUSTRIAL ELECTRONICS

"FLAMUTROLLER"

A safeguard for Gas or Oil fired furnaces.



The "Flamutroller" operates instantly upon flame extinction closing the supply valves and preventing an accumulation of unburnt fuel in the combustion chamber. The risk of explosion is completely eliminated. Write for descriptive leaflet MF 3.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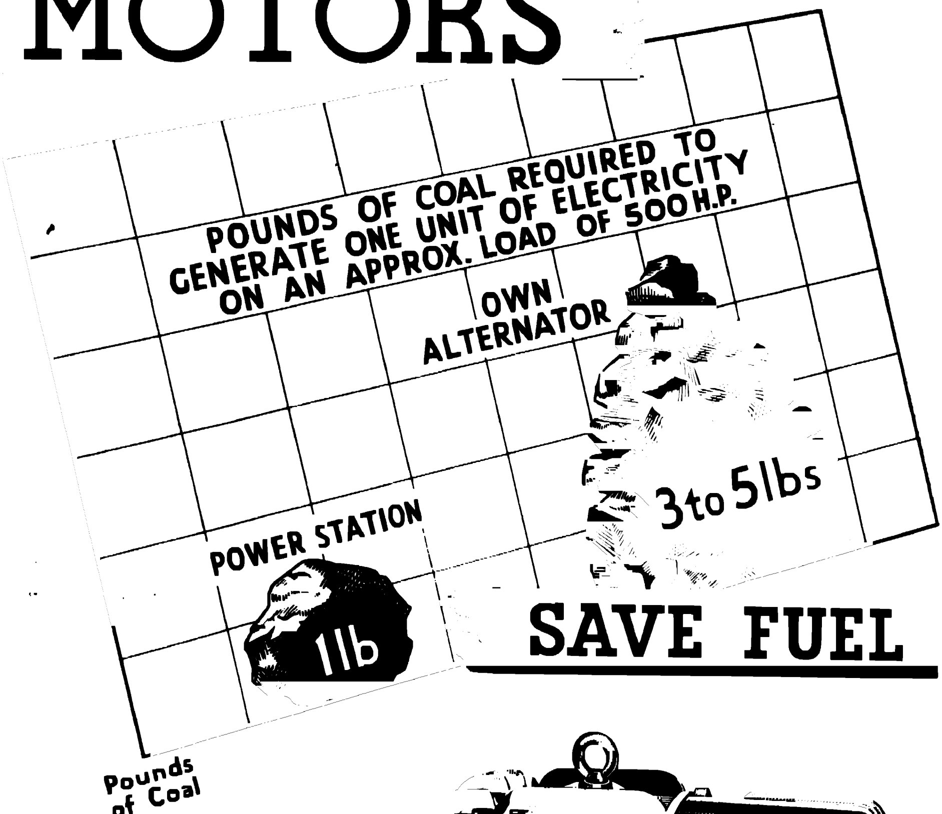
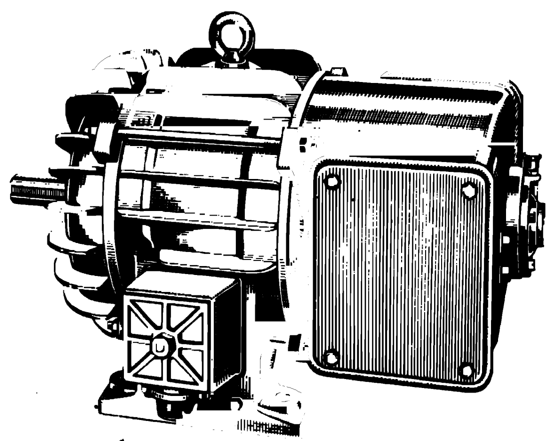
Rolled from
Anderson Shelter Material
GALVANISED
APPROX. 15 GAUGE
SIZE
7ft. 8ins x 32ins.
FULL DETAILS CAN BE OBTAINED
FROM ANY
COX & DANKS LTD. BRANCH
NOW

MOTORS SAVE FUEL





Consumption of our most scarce commodity — COAL, is lowest per horse power when generated at power stations and transmitted through electric motors— Savings for you—Savings for your country.

BROOK MOTORS LIMITED

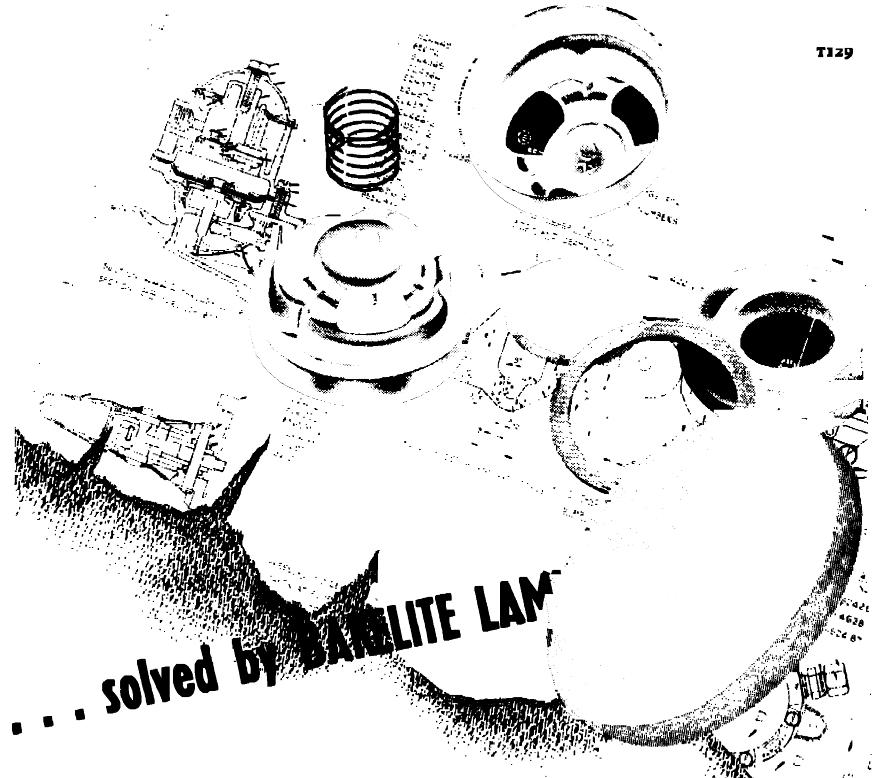
EMPRESS WORKS • HUDDERSFIELD

H H .48

This was the problem

To produce a petrol pump valve that would withstand continuous service in varying grades of petrol, have a smooth, flat surface without lapping and be free from scratches, pits or blisters.

T129



For many years the AC-Sphinx Spark Plug Company tried to find a material capable of giving continuously reliable operation when used as the valve of their well-known petrol pumps. Besides meeting the difficult conditions of service, a good valve, to quote the manufacturers, must have 'lightness combined with general strength, resistance to distortion and excellent finish, and we have found BAKELITE Laminated to be ideal for the job.'

Valves for the standard automobile petrol pump made by the AC-Sphinx Spark Plug Company are punched from a fabric grade of BAKELITE Laminated

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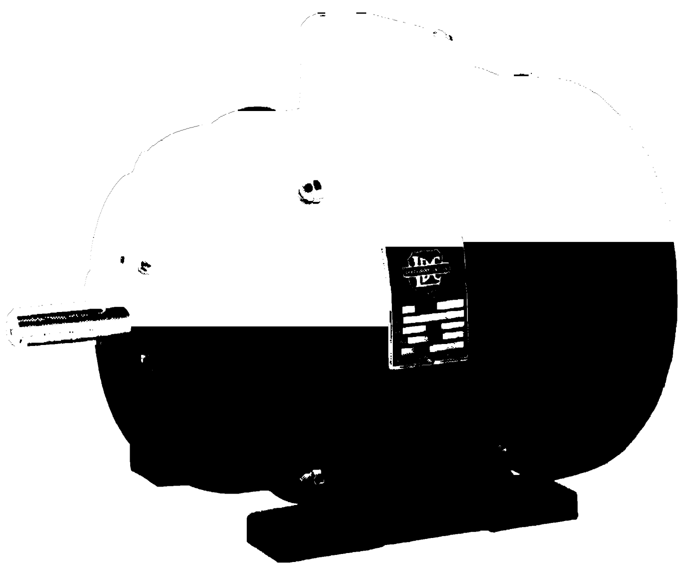
THE MODERN FRACTIONAL H.P. MOTOR



L.D.C. "Fankuld" (T.E. Frame-cooled) Motor

LANCASHIRE DYNAMO & CRYPTO LTD

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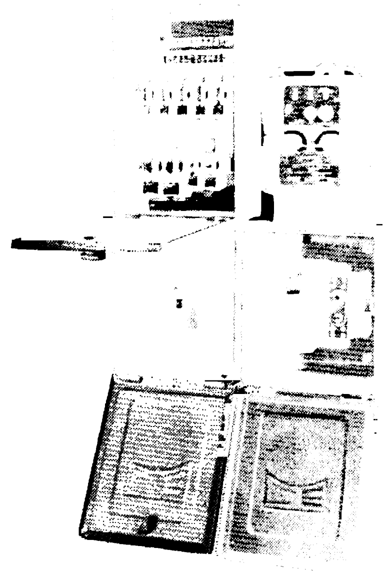
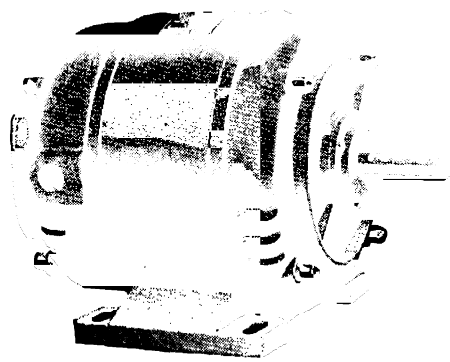
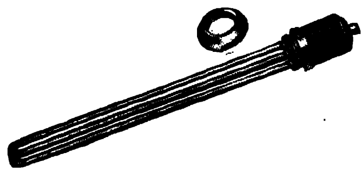
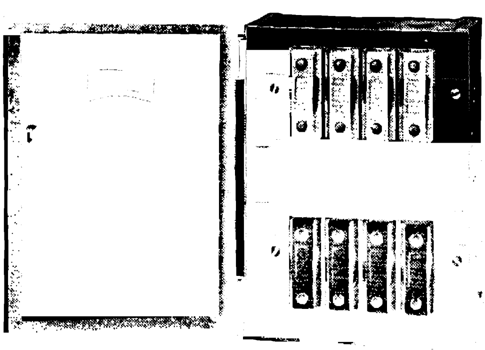
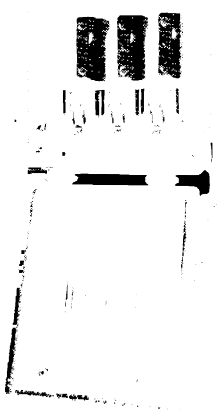










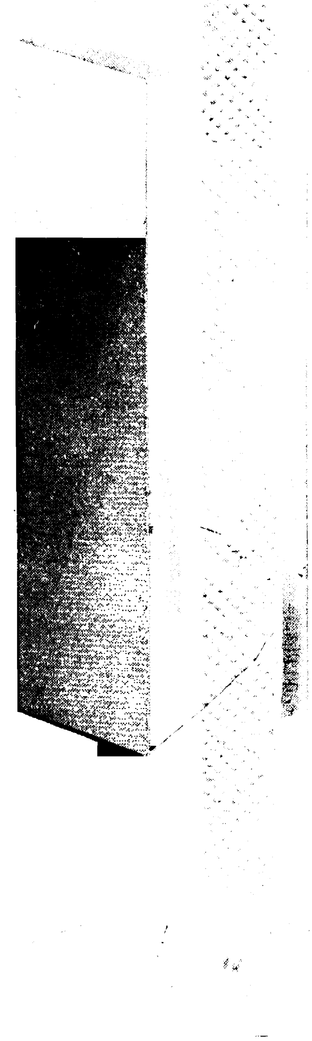
ALWAYS ON ITS METAL

MIDSAW

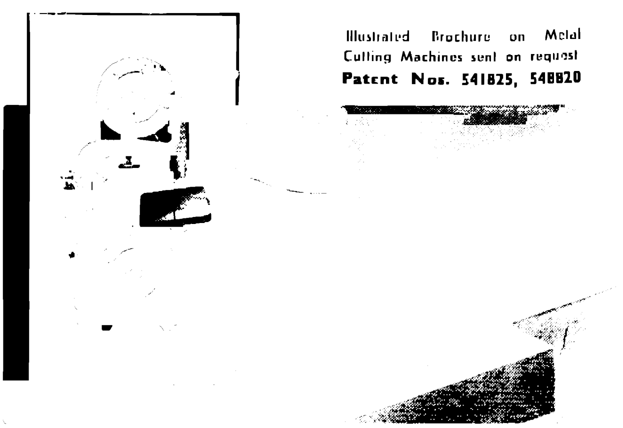
The Better

BANDSAW

AND BANDFILE MACHINE FOR TOOLROOM ACCURACY



The adjustable side support channel on the MIDSAW controls the band file ***down to the work***, enabling the operator to file into corners with ease and precision. This is only one of the many exclusive time and labour saving features which have made the MIDSAW Toolroom Bandsaw and Bandfile Machine the finest machine tool investment. Essential in the manufacture of Dies, Press Tools, Templates, Gauges and all similar work of regular and irregular shape, the MIDSAW, even in "Junior" hands, saws and files with a speed and precision unattainable by any other method.



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Patent Nos. 541825, 548820

9 Outstanding Features

(5) Pressure up to [illegible]

(6) Correct materials and creatment together with precision manufacture give endurance.

(7) No special tools or skill required to dismantle for inspection or service.

(8) Capacity and/or direction of rotation can be quickly changed.

(9) Duplex oil seals fitted for standing and running conditions.

The new "V.S.G." vane pump is a hydraulically balanced, constant duty unit which provides maximum performance occupying a minimum of space. Among the many special features listed alongside, it possesses a volumetric efficiency of 90%. It is designed and manufactured by Vickers-Armstrongs, Ltd., and all interested in application of hydraulic power are invited to avail themselves of wide experience which is always at their service on request.

Volumetric Efficiency 90%

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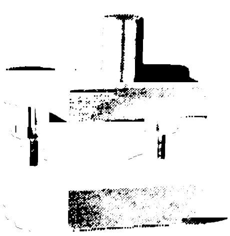
VSG P5

AT precisely five minutes past eight Henry kisses his wife good-bye and sets off for the station. At eight fifteen he is unfolding his paper in the right hand corner seat of the third carriage. Just as he did yesterday. And just as he will do tomorrow. There's no craving for adventure in Henry's blood. He'll never take a chance; never do the unexpected. And a darned good job too — Henry is a dispensing chemist! Steady and dependable — that's Henry. Like our Die-Sets.

DESOUTTER DIE-SETS



Telephone: Colindale 6346-7-8-9

DESOUTTER BROS. LTD., The Hyde, Hendon, London, N.W.9. *Telegrams : Despnuco, Hyde, London.*

C.R.C.58.

HOPKINSON ELECTRIC COMPANY LIMITED

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Telegrams :
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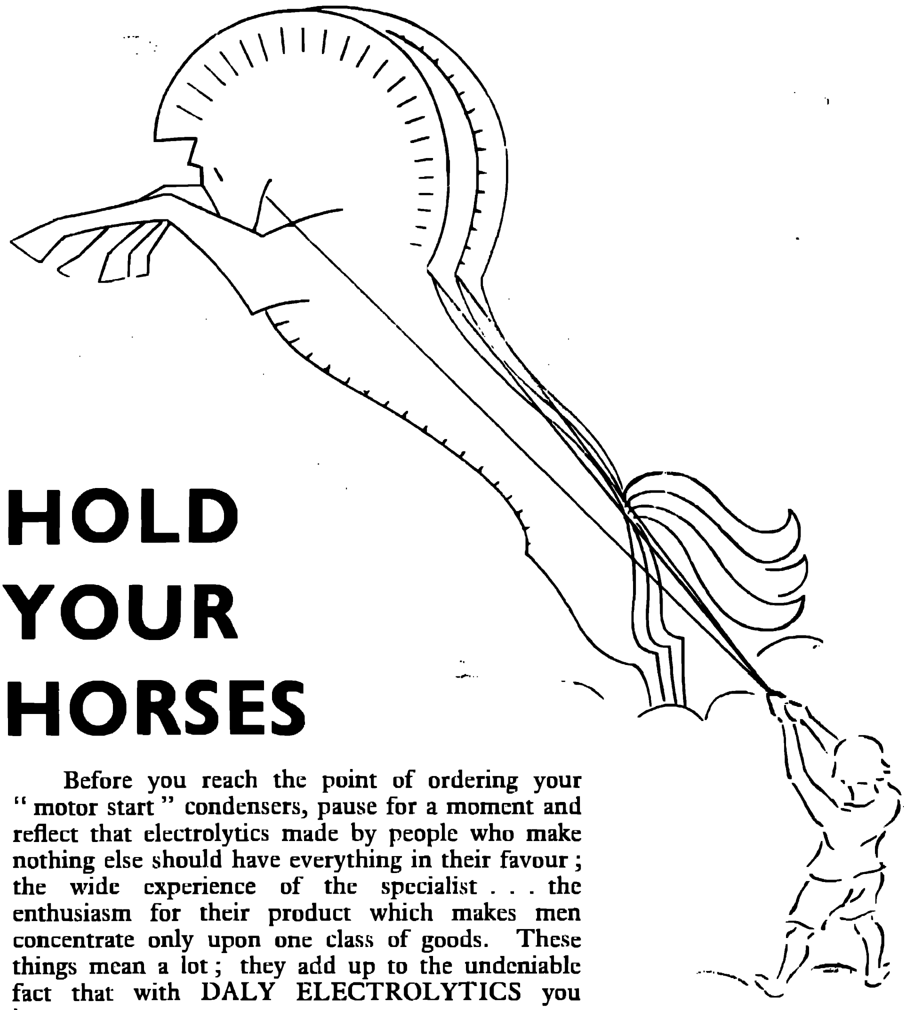
E L E C T R O L Y T I C S

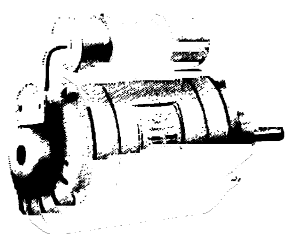


HOLD YOUR HORSES

Before you reach the point of ordering your " motor start " condensers, pause for a moment and reflect that electrolytics made by people who make nothing else should have everything in their favour ; the wide experience of the specialist . . . the enthusiasm for their product which makes men concentrate only upon one class of goods. These things mean a lot ; they add up to the undeniable fact that with DALY ELECTROLYTICS you just cannot go wrong.

For over 20 years DALY have concentrated upon the design and production of condensers.

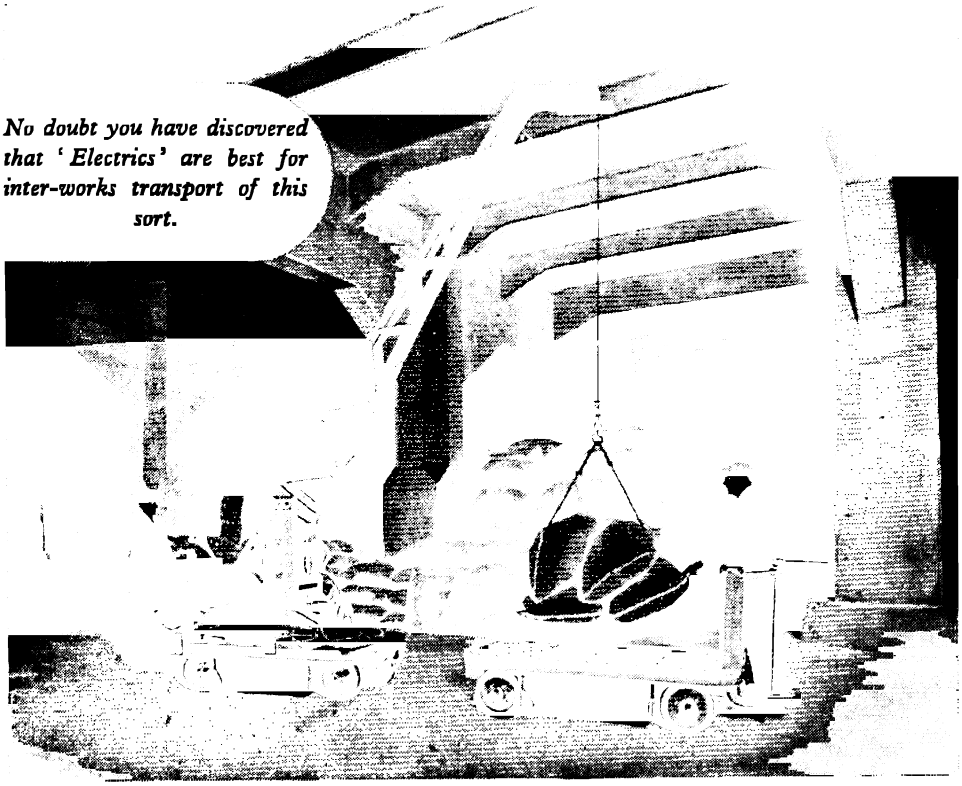
STANDARD TYPES from 15 mfd. to 400 mfd.
VOLTAGES from 110 to 350 V. A.C., R.M.S.



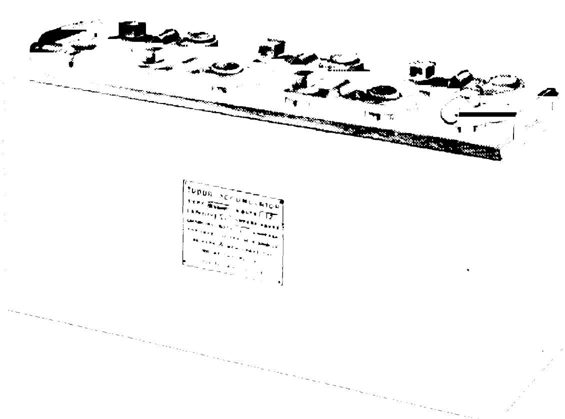
DALY (CONDENSERS) LTD.

Condenser Specialists for over 20 years

WEST LODGE WORKS, THE GREEN, EALING, W.5 . Phone : EALing 4841, 4888



but have you discovered that Tudor Accumulators are the most dependable power unit for any type of Electric?



TUDOR ACCUMULATORS

T55/47 THE TUDOR ACCUMULATOR CO. LTD., 50 GROSVENOR GARDENS, LONDON, S.W.1.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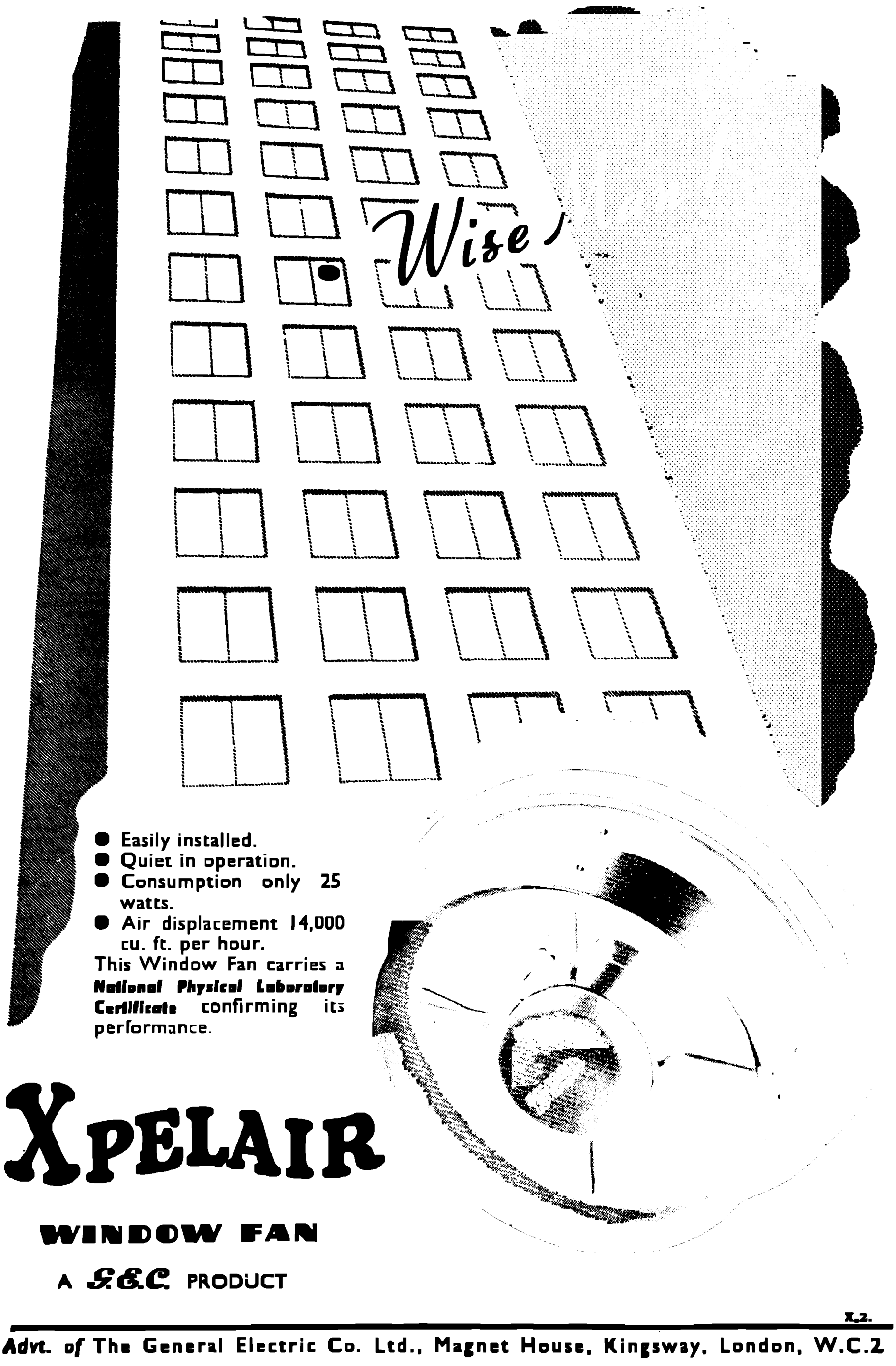
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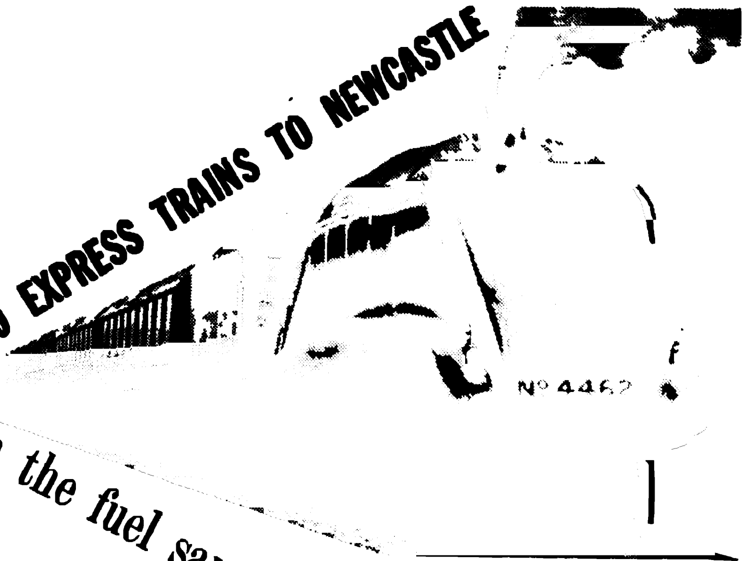

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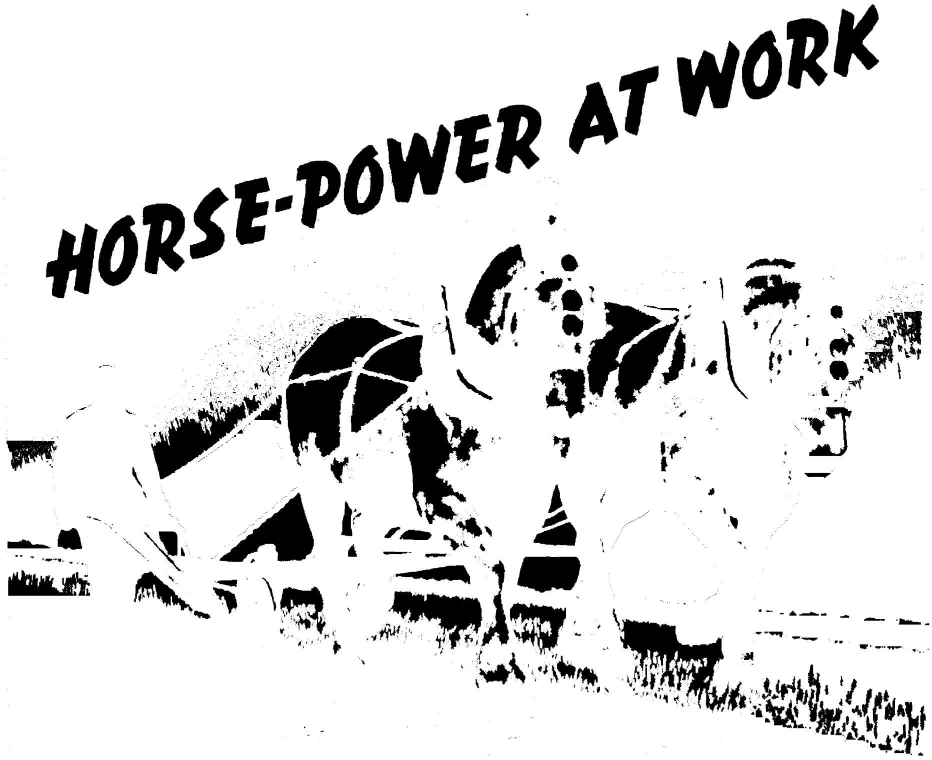

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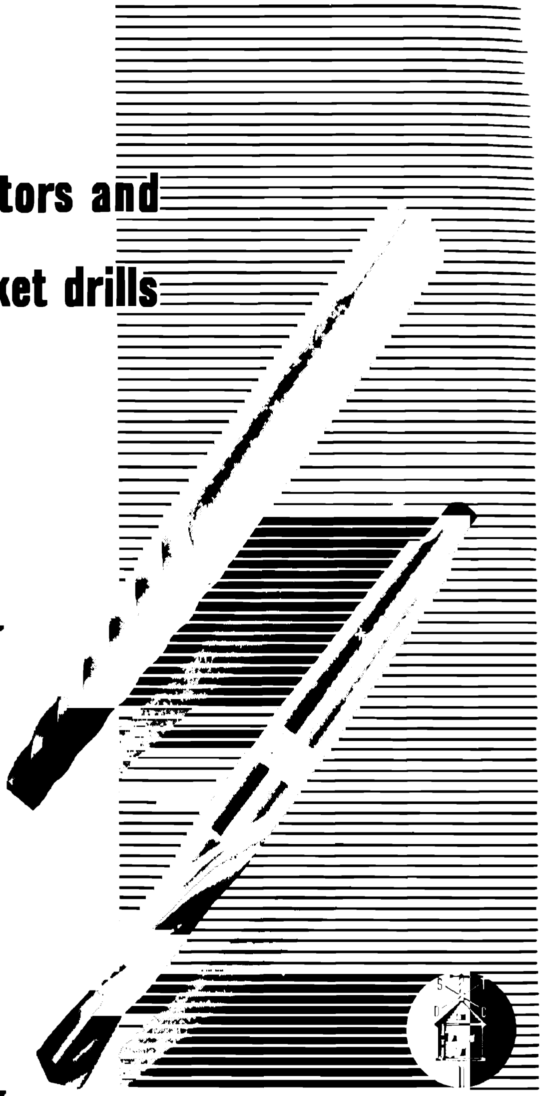

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KILLING THE GOLDEN GOOSE

A COLD wind has swept from Scarborough through British industry. Speaking at the Labour Party's Conference, Mr. Dalton hinted ominously of " other arrangements " next year if " every profiteer " fails to " pay his special contribution to the nation's exchequer." Obviously, he seeks some form of industrial levy on similar lines to Sir Stafford's " once-and-for-all " Budget tax. The ex-Chancellor cannot have read the fable of the greedy farmer who killed the goose that laid the golden eggs. Neither is he an industrialist—or he would know the vital importance of adequate working capital. Perhaps he confuses the latter with profits. Let us investigate this business of profits and profiteers. The figures given below are taken from the balance sheets of some of the biggest companies in Britain and are for the last year of trading.

Of each £1 received by the textile firm of Horrockses, Crewdson & Co. from its customers, raw materials took 9s. 10d. and wages and salaries 4s. 11d. Running of the plant and selling and distributing the company's products took 2s. 11½d., while the Government took 1s. 4d. in taxation. Interest on loans took 3½d., leaving the company 8d. with which to add to its reserves and pay the dividends on its Ordinary shares, that is, less than 5 per cent. between these two items. The income of Vauxhall Motors was nearly £20m. Wages, salaries, and employee benefit schemes took £4,800,000. The amount distributed to shareholders was £174,450, or less than 1 per cent. Out of each £1 of the sales of S. Smith & Sons (England) materials took 5s. 3d., while wages, salaries, pensions, insurance, and welfare took 9s. 0½d. Total costs, including depreciation, were 17s. 7¾d. Above that, 8¼d. was ploughed back to develop the enterprise, and the Government took 1s. 4½d. in taxation. The shareholders got a net dividend of 3½d. out of each £1, or 1.5 per cent. The total income of the Metal Box Company was £16,412,000. About £11,150,000 went for materials, supplies, and services. Wages, salaries, and employees' benefits took £4,059,000. Dividends to shareholders were £214,000, or 1.3 per cent. of the total income. Joseph Lucas, Limited, spent out of each £100 of its income £42 on wages, salaries, national insurance, holiday pay, pension funds, and welfare; approximately £48 went on materials, maintenance of buildings and plant, rent, insurance, and overhead expenses. After the deducting of income-tax exactly £1 in each £100 of income went to shareholders in dividends—*i.e.*, 1 per cent. The United Steel Companies' income was £38,961,000. Wages, salaries, insurance, holidays with pay, and pensions took £12m. Raw materials and fuel took £20,766,000. The amount distributed to shareholders in profits was £553,000, or 1.4 per cent. of the total income.

In each case it is interesting to note the proportion of income absorbed by taxa n in relation to that distributed as profits in the form of dividends. Truth is that indus y, so far from reaping a golden harvest, is finding immense difficulty in meeting the c st *of plant replacement and expansion.* Despite the conscientious ploughing back of profits, maintenance of equipment is taxing its resources to the hilt. Nor is there *likelihood of any early improvement.* On the contrary, many factors beyond industry's control—such as rising price of nationalised coal, power and rail transport—tend to force up overheads higher still. Reserves now being painstakingly accumulated for plant replacement a year hence may prove quite inadequate when the time arrives. Money invested in industry is our essential working capital. We rely on it not only to restore our blitzed commerce but to furnish funds for all social service schemes and other Government expenditure. If we draw on industry's capital we must sacrifice the income now being derived from it. Not even Mr. Dalton can have it both ways.

Should its already overstrained resources be further milked, industry would find itself financially unable to maintain its plant at that high pitch of efficiency which modern competition demands. Our overseas rivals would score a runaway victory in the field of international trade. No worse disaster could overtake us. Let Mr. Dalton recall the remorse of that farmer in the fable after he had killed the golden goose —and refrain from urging his Party to an equally foolish step.

MR. SHINWELL LEADS ON

MR. SHINWELL must be a lively trial to his Government colleagues. In the winter of 1946/47, for instance, he rocked them on their heels when he threw the fuel crisis into bold relief by denying its existence. He went on to shake them badly when he let the electricity cat out of the bag much too soon by laughing off inevitable rationing. "Shedding the load," he ultimately termed it. Now, he has poleaxed the entire Labour set-up by blurting out that when they nationalised the coal industry they didn't know what they were doing. Obviously, Mr. Shinwell is a man to be treated warily—and not by the Labour Party only.

This time, he tells the sober truth. " Unfortunately," says Mr. Shinwell of coal nationalisation, " it has not worked out too well." This is what he means, according to estimates of the first annual report to be issued this month by the National Coal Board. 1937 coal output exceeded 23 cwts. per man-shift with 52% machine-cutting. Now, it is 21 cwts. with 74% machine-cutting. Absenteeism is now double the 1938 figure. Trading loss for 1947 was more than £20,000,000, a deficit likely to be reached again in 1948. The price of coal has risen to 40/- per ton from the pre-war 18/-. More than £9,000,000 was sunk in mechanisation. The production increase was—nil. " We thought," comments Mr. Shinwell neatly, " we knew all about it. The fact of the matter was we did not."

Mr. Shinwell may be an embarrassment to the Government, but they clearly accept him as a responsible member. Otherwise, why was he made War Minister after his coal fiasco ? His words, therefore, carry weight—all the weight of a Government pronouncement. And his present assertion—supported by facts and figures—is that the Government has taken a wild gamble with our basic industry : has made it the subject of an experiment for which neither consideration nor experience was adequate. The gamble has failed—as Mr. Shinwell and most of the electorate know. Yet the Government continues to play maniac roulette with other basic industries. It has already staked gas and electricity. For bigger and better stacks of nationalisation chips it proposes to offer iron and steel, joint stock banks, industrial insurance, ship-building, the aircraft and aero engine industry, the motor-vehicle industry, wholesaling of food and export merchandising.

That is deliberate and indefensible refusal to face facts, as Mr. Shinwell has incautiously but bravely pointed out. It would be as well if the Government borrowed his courage and asked the country's opinion on its projected speculations with the security of 50,000,000 people.

Current co[illegible]ing industry

TRENDS

UNCERTAINTIES clouding the outlook, al[illegible]ttled down by the Marshall Aid, have not all been dispersed. The atmosphere is less opaque for the industrial world and Britain is now able to chart her economic course with clearer indications and with the definite intention of obtaining the best possible results from " the life-giving stream coming across the Atlantic."

The body-blow aimed at the captains of industry and commerce by the investment income levy, has met with a tidal wave of criticism. The late Lord Keynes described the process, which he labelled the " euthanasia of the rentier." One of the crudest delusions which has ever fuddled the human mind is the idea that a Nation can tax itself into prosperity.

The Government's wages, prices and profits policy has been accepted by the T.U.C., after a post-Budget review of the situation and while there are still loopholes for wage increases, it is much less easy now to lightheartedly advance claims. Price-fixing Orders are in force and cover numerous type of goods with the exception of books, newpapers and jewellery.

The Coal, Steel and Cotton Spinning industries are going ahead towards attaining their " targets " and are cheery milestones in the country's uphill recovery struggle. Coal is virtually equivalent to convertible exchange and, as such, can be used to tempt overseas buyers to absorb our manufactured goods, especially where the sellers' market is waning and in countries where competition is keen and trade barriers are being put up. Despite all that was done at Bretton Woods and elsewhere, we have not got back to the system of multilateral freedom in International trade. We have to rely upon protective measures and bilateral trading. But on the practical plane, our position gives encouragement.

Conjuring With Controls

Whether it be factual or a political Party gibe that no fewer than 25,000 controls hem in the individual lives of our people, it is well known that we can no longer talk of " Controls " *tout court*.

Actually we now have three separate systems. The first group of controls belongs to what might be called the philosophy of the controlled economy. They include branches like the nationalised industries and the control of investment policy—specifically authorised by Act of Parliament, not merely brought in by Orders under enabling legislation. A second system of controls originates in shortages of consumer and capital goods, and in the balance of payments crisis. It is promised by the Government that some of these will be abolished when opportunity permits. But this is a more or less flocculent promise. Another type of control is in connection with the Government's anti-inflation policy—Direction of labour, " voluntary " limitation of wages, dividends and prices.

To reduce prices and profits without curbing the forces which propel them upwards is the wrong approach to a problem where the urgently-needed corrective is increased output, primed by the stimulant of incentive. It is not an easy matter to arrive at any equitable basis either for assisting or reducing profits or to judge exactly how controls affect them. Practical experience indicates that controls promote scarcity.

The nation has listened to those who promised that controls would " vanish with the advent of Victory " but planning and " target " setting have still to be shaped in the fear of becoming enmeshed in the barbed wire of their entanglement.

Management Monopoly and Inventions

Among the many channels into which the Government has syphoned its intellectual skill, the most recent and by no means the least obtrusive, are the Monopoly Bill, Development of Inventions measure and the newly-formed British Institute of Management. The Council of this latter is composed of representatives of the F.B.I., the T.U.C. and Civil Servants, and its main object is to illuminate the way for improving the standards of management practice throughout the country.

More far-reaching in their objectives are the Monopoly Bill and the Inventions Statute which has established the National Research Development Corporation. The functions of this latter are to secure the development and exploitation of inventions resulting from Government research, or any other invention not being adequately developed, and to help inventors who have no resources. In the past, description of discoveries made by British scientists have appeared in scientific and technical journals, without the protection of patents. They have been seized upon in America and Germany, purloined and patented, and we have had to pay royalties to these foreign plagarists ! The Inventions Bill will afford facilities to avoid this.

Growth of monopolies and restrictive practices were put forward by the Government as the *raison d'etre* for the Monopoly (Inquiry and Control) Bill. It was promised in 1945 election manifesto by Conservatives. Our prosperity has been built up on the freedom of contract, competition and enterprise of industrialists and not upon mergers, trusts and giant organisations, though frequently their financial resources enable technical advances to be made and prices reduced. Their dangers and scale of grandeur have however been questioned and a judge once averred that big combines led " to a great deal of gerrymandering."

News and views of men who lead

QUOTING the

Motor market can be ours

MR. GEORGE WANSBROUGH, Chairman of Jowett Cars, Ltd. :—

I believe that the future holds the possibility of a development of motor transport all over the world far greater than has yet been seen or generally forecast. Once the basic necessities—food, clothes, and shelter—have been secured (and in securing them motor transport has a big part to play), there is not one of the important facilities of civilisation which the heart of man so ardently desires as the facility of individual, or family, transport which the motor-car offers. The statistics of motor-car use in the richer countries gives ample evidence of this. If mankind can solve the problems of economic organisation as successfully as the technical problems of economic production have been solved, there will over the next 25 years be an enormous growth in the world trade in motor-cars. I believe that if the British industry goes about its business in the right way, and if the Government allows it the necessary facilities, this country can achieve the lion's share of that trade. If we can, the contribution to our balance of trade, and to the solution of others of our economic problems, would be of major, possibly of decisive, importance. Many things are needed, but for the moment the vital factor is this—that the Government should see to it that the motor-car industry is enabled to achieve that which is essential to lower costs—namely, increasing volume—and that means, of course, the necessary supplies of steel.

Stay bureaucracy and speed recovery

MR. F. W. R. DOUGLASS, Chairman of Chinnor Cement and Lime Co. Ltd. :—

In a world where economic and political questions are so inextricably mixed, and in a country where taxation is no longer governed solely by economic factors, prophecy for the short term is more than usually dangerous, if indeed not futile.

We in this country are faced with the inescapable fact that our whole future depends on our own individual efforts; indeed, increased production holds the key not only to future prosperity but to survival.

To obtain this vital increase I am convinced that, in the absence of supermen, one of the first essentials is not only to stay the paralysing hand of bureaucracy from creeping deeper into industry, but to reverse the trend and allow greater scope to those whose whole life work has been the efficient management of industry. By so doing not only would initiative and imagination once more be given a free hand, but automatically an improvement would take place in the proportion of productive to non-productive man-power.

Bulk purchasers strike a poor bargain

SIR ERIC VANSITTART BOWATER, Chairman of the Bowater Paper Corporation, Ltd.:—

There is little doubt in my own mind that the continuance of bulk purchasing by the Government of our raw materials has had, and continues to have, a detrimental effect upon, on the one hand, the amount of those raw materials that is available to this great British industry and, on the other hand, the prices that it has to pay for them.

The prices now being paid for the two principal ingredients in the manufacture of newsprint are substantially in excess of what would appear to be warranted by the costs or production thereof in the respective producing countries. Furthermore, the quantities of those raw materials that have been purchased by the Government fall short of what could be acquired if the Government's purchasing agents were allowed greater freedom.

I suggest that the time is arriving, if indeed it has not already arrived, when the paper industry should again become responsible for its own purchases of these essential materials, and I hope that early consideration will be given to this matter. I say this recognising to the full the need for the conservation of hard currencies, particularly dollars, but it is my belief that were we to be afforded a substantial degree of freedom we could obtain a larger share of the raw materials available, and generally on more favourable terms.

U.S. Capital is being attracted to Britain

MR. KENNETH M. CHANCE, Chairman of British Industrial Plastics, Ltd. :—

The recognition by business men in the U.S.A. of the fact that they cannot continue to export unless they are prepared to accept payment in the form of imported goods, is

Chairman

taking the form of a desire to invest in industry in this country, so favourably situated in its knowledge and experience of finance and commerce, in its skill and craftsmanship in manufacture, in its geographical situation, and most important of all, in its necessity to produce goods for exchange for food and raw materials, to resume its position of supplier to many countries of their requirements of manufactured goods. American business men are no fools and can see our position objectively whereas we hear of nothing but the dangers that beset us.

" Senior Partner " doubles the price of beer

RIGHT HON. LORD BROCKET, Chairman of Walker Cain, Ltd. :—

The brewing trade was once again in Mr. Dalton's autumn Budget asked to contribute more to the Exchequer by a further rise in beer duty.

It is of interest to point out that the duty on beer has been increased no less than seven times since the outbreak of war in 1939, and the price of ordinary mild ale is now little short of two and a half times its pre-war price. Increases of a like nature have been imposed on wines and spirits, and we hope that at some future time we may witness a reduction in these duties, when conditions permit. The Chancellor of the Exchequer truly is the senior partner in our business, as 70 per cent. of our gross income finds its way into his capacious coffers.

It can happen here

MR. WILLIAM SHEARER, Chairman of the Midland Counties Electric Supply Co., Ltd. :—

Never in the history of our country was there more need of national unity than at present, and I am convinced that the Government's policy of nationalisation of our key industries has done more to disunite the nation than some of the other major items in the Socialist programme.

Many of us are acutely aware of the menace of Communism and of the eclipse of freedom which follows in its train. I hear people say, " It will never successfully take root here to the extent that our liberties, and indeed our lives, might be in jeopardy," Don't let us be too complacent ! We see the way these evil philosophies have been infiltrated into many of our trade union and other organisations, and a coup by a small but active unscrupulous and determined body of men cannot be dismissed as beyond the bounds of possibility, even in this great country, particularly in this the winter of our discontent.

That is one of the reasons that I view with apprehension the key industries—coal, transport, communications, electricity, gas, and possibly steel and chemicals— becoming State monopolies under the absolute control of two or three Ministries, and so ready to hand to come into the grip of a small but powerful caucus, inspired and controlled by alien influences.

Stabilized sterling of first importance

MR. V. A. GRANTHAM, Chairman of the Chartered Bank of India, Australia and China :—

I refrain from comment upon affairs in Great Britain, which are constantly under review, except to say that, from experience gained through wide contact with the outside world exchange markets, it is impossible to stress too strongly the importance of recreating confidence in Britain's monetary stability.Britain's position as banker to more than half the world has been endangered through the threat to monetary stability of the very large adverse balances of trade and payments which are proving so difficult to reduce and bring within control.

It is not that the world can afford to dispense with Britain's services as a banker, but that it can and does refrain from buying sterling until the last possible moment while selling it at the first opportunity whenever monetary stability is thought to be in danger, and there are many other devices, quite legitimate, but outside the power of the Exchange Control to check, which can have the effect of increasing imports and holding up exports.

All this adds up to saying that, if full confidence in our monetary stability can be restored, there is likely to be a substantial return of sterling into this country with a consequent easing of the position, and, provided the country stands together and works all out to increase production for export, while conserving internal expenditure and consumption, we can hope that, aided by the Dominions and Colonies, British sterling will regain its stability even if the country cannot aspire to be the world's greatest creditor nation.

"Rayon" is the recognised generic term for man-made fibres. The methods described by Mr. W. L. Carter in the following pages are those adopted by Courtaulds Ltd., the pioneers of rayon production in this country.

Viscose rayon

AMONG the major manufactures of Britain is the production of rayon. From an insignificant beginning it has developed into one of the principal industries of this country, with immense ramifications in many countries, and having an export trade serving practically every part of the globe.

"Rayon" is the recognised generic term for man-made fibres. The Textile Institute has approved of the following definition: "All fibres for textile use which are not of natural occurrence." Since rayon is used on all types of textile machinery to produce fabrics many of which have no resemblance whatsoever to silk, it is both misleading and incorrect to describe it as "artificial silk."

At the opening of 1948 the rayon industry showed greatly increased output figures as compared with those of pre-war days. In 1935 the monthly average of continuous filament yarn was 8,990,000 lbs., but in December 1947 the amount was 11,130,000 lbs., although a higher output was recorded earlier in the year. Production of staple has grown enormously from the 920,000 lbs. monthly average in 1935 to 8,060,000 lbs. in December of last year. Consumption of rayon yarn has increased from a weekly average of 1,360,000 lbs. in 1943 to just over 2½ million lbs. by the end of 1947. Exports of rayon yarn show a similar increase from 750,000 lbs. monthly average in 1935 to nearly 1½ million lbs. of single yarn in December 1947. Exports of piece goods during the same period have grown from 4,319,000 square yards to 11,656,000 square yards. In the ten years 1938 to January 1948 the monthly average value of exports of silk and rayon yarns and manufactures has grown from £459,000 to £2,754,000.

The method of manufacture described below is that of the essentially large scale mass production viscose process employed by Courtaulds Ltd., pioneers in this sphere of rayon production, who are the largest makers in the British Empire of viscose rayon. All the illustrations depict stages in the production of finished fabric from the raw materials.

The history of rayon

The history of rayon is interesting. Early in the 18th century Rene de Reamur began his experiments, but it was not until 1855 that a Swiss scientist named Audemars took out a patent for making filaments by a nitro-cellulose process. Subsequently, in the 1880's Sir Joseph Swan—during experiments with materials for making electric lamp filaments—produced a glossy silken thread by squirting a solution of nitro-cellulose. This discovery was patented in 1883, but was not commercialised. A year later, Count Hilaire de Chardonnet took out a French patent for a nitro-cellulose rayon process, and afterwards began commercial production in factories in England, France, Switzerland and Belgium. Chardonnet is sometimes referred to as the first manufacturer of commercial rayon, but his process was not wholly successful, and has since passed out of use. In 1890 Despaissis patented a cuprammonium process, which was subsequently developed in Germany.

Next came the viscose process. Two British chemists—C. F. Cross and E. J. Bevan—invented a cellulosic solution called "viscose," which they patented in 1892. Six years later the method of spinning this solution into a thread of rayon was developed by Stearn and Topham. In 1901 Topham patented the famous spinning pot. Three years afterwards the process was purchased by Courtaulds Ltd., who thus became the

Left top—**placing wood pulp in press, prior to running in liquid caustic soda.** *Left cent.*—**Pfleiderer or shredder showing the blades to cut up the alkali cellulose into "crumbs."** *Left bottom*—**"crumbs" are now churned with a definite quantity of carbon bi-sulphide.**

first concern in the world to make rayon production a commercial success.

The cellulose-acetate process was the last of the older rayon processes to be developed, and commercial manufacture in Britain began shortly after the First World War.

While many new methods of rayon manufacture are at present in experimental and development stages, the three well known processes in current commercial use are the viscose, cellulose-acetate, and cuprammonium processes. Viscose accounts for the greater part of the British and world output of rayon.

Rayon is produced in two forms as either rayon yarn or rayon staple. The former is a continuous thread, normally termed "continuous filament," while staple is that same thread cut into equal lengths or staples. The difference between the two lies in the uses to which they are put by the textile

Right bottom—The cellulose Xanthate formed from the "crumbs" and the carbon bi-sulphide is dissolved by weak caustic soda in this mixer. We now have liquid viscose for the first time. _Right top_—This photo shows the nature of viscose, it is here seen being poured into a bowl.

industries. The range of uses for rayon staple is almost limitless, as it can be processed on any type of textile machinery, and can be woven into a cloth with almost any kind of handle. Both rayon yarn and staple may be used by themselves in a fabric or mixed with each other, or mixed with natural fibres. These combinations render possible an almost unlimited number of effects otherwise unobtainable.

Cellulose from wood

Viscose rayon is made basically from the cellulose obtainable from spruce wood. In Canada or Scandinavia the spruce trees are felled, and the logs floated downstream to the pulp mills, where they are processed into almost pure cellulose. After the bark is stripped, the logs are cut into small pieces, boiled in chemicals to remove resinous impurities, washed, bleached and scoured. Finally, the cellulose is dried by being run over steam-heated cylinders. It now resembles sheets of thick blotting paper, which is guillotined and baled up for carriage to this country.

In the British rayon factory the cellulose receives the greatest possible care. Weight, time and temperature are all carefully checked, and even the degree of moisture in the atmosphere is controlled during the next operations. Samples are constantly tested, and nothing left to chance.

Caustic soda, of which thousands of tons are produced in Britain for the rayon industry alone, plays an important part in the next stage. After the cellulose has been cut to standard size, gauged and weighed in batches, it is immersed in a bath containing a solution of caustic soda. This dissolves out unwanted impurities, while the remaining cellulose combines with the chemical to form what is known as "alkali cellulose." Severe mechanical treatment follows. Hydraulic presses remove surplus moisture from the sheets of pulp, and grinding machines, which resemble dough mixers and are termed "Pfleiderers," tear the sheets between large spiral blades and heavy serrated bars until they have the appearance of crumbs. These crumbs are then emptied into large bins and stored for a period under identical atmospheric conditions in order that the chemical action of the caustic soda may be completed. The cellulose alkali crumbs are next transferred to the churn room where they are emptied into large hexagonal churns. A measured quantity of carbon bi-sulphide is then added. When the churn is operated the crumbs change from a creamy-white insoluble material to an orange-red mass soluble in water. This new substance is called cellulose xanthate. It is on the result of the British discovery of Cross and Bevan that this substance is soluble in water that the greater part of the world's production of rayon now depends.

The next stage is the formation of viscose. This is made by transferring the cellulose xanthate from the churns into large mixers where it is dissolved in dilute caustic soda. A series of paddles keeps the water in constant circulation until the xanthate is thoroughly

dissolved. The resulting fluid—in appearance and consistency very like honey—is viscose. This thick liquid must now mature for several days, and for that purpose is stored in large containers under controlled conditions in cellars called " caves."

During this storage period the viscose is meticulously filtered to remove all undissolved cellulose and other solids. Filtration is carried out by passing the viscose through several layers of specially woven cloth and thick sheets of wadding placed between perforated plates. This process is repeated three or four times. In addition, vacuum pipes extract any air or gas that may have been in solution. Any suspended matter in the solution would spoil the extrusion of the filament, the next stage in the process.

Continuous filament yarn

When a fine stream of viscose is poured into dilute sulphuric acid the viscose coagulates as it enters the acid, then it solidifies, and in a few seconds forms a continuous thread. In the commercial process the viscose is forced through tiny holes in a spinneret shaped like a silk hat, but roughly the size of a thimble. Sometimes there are as many as 500 tiny holes in its head. The result is viscose continuous filament rayon yarn. It is now obvious why such extreme care is necessary in the filtering process, for the slightest speck of matter in suspension or air bubble will cause a stoppage in the tiny holes of the spinneret, which is usually made from a platinum-gold alloy. The number of tiny holes determines the number of filaments in the yarn. The size of the yarn is thus described technically as being of so many " denier."

Spinning and winding follow. As the filaments emerge from the spinnerets they are drawn rapidly over glass wheels and dropped down a glass tube into a fast revolving box. As the glass funnel rises and falls the rayon is drawn into the box by centrifugal action, given a slight twist, and wound to resemble a cake from which the interior has been cut. It is now known as a cake of rayon yarn. The diameter and speed of the box in ratio to the delivery rate of the glass wheel determines the amount of twist given to the yarn. After spinning, the cakes are wrapped for protection, and bleached. They are then dried, first in a hydro-extractor, and then in hot rooms. Finally, after elaborate testing and inspection they are ready for processing and despatch to weaving and knitting mills for conversion into fabric, hosiery, etc.

The method of making rayon staple is similar to the foregoing up to the spinnert stage when the filaments from several spinnerets on a frame are drawn together, not twisted, into a rope of the thickness of a thumb. This is drawn into a cutter and cut into equal lengths. The staples are then desulphurised, washed, dried and baled up ready for despatch to the spinning mills. The length of the staple varies according to the type of spinning machinery for which it is required. Cotton machinery requires a length of one or two inches, whereas worsted plant needs lengths of two to seven inches.

Rayon staple has several advantages for the spinner. It comes to the mill absolutely clean and does not need sorting, all the fibres being of exact and uniform length. The usual fine dust that hangs in a cloud over the frames in a cotton mill is wholly absent during the spinning of rayon staple. Since rayon staple can be made finer or coarser, longer or shorter at will, the variety and range of fabrics that can be made from it is very wide.

In the cellulose acetate process the basic material is either spruce wood or cotton linters, or a mixture of both.. After preliminary treatment the cellulose is treated with acetic acid and acetic anhydride, being finally converted into a thick syrupy liquid. From this cellulose-acetate flake is obtained. The dried flake is then dissolved in acetone to form the spinning dope, which is extruded as filament from a spinneret into a chamber of hot air that evaporates the acetone, leaving the solid filaments. These are then drawn together and wound on to a bobbin as finished yarn.

High tenacity yarns

Cuprammonium rayon has a basis of cotton linters or wood pulp which—by boiling, bleaching and washing—are broken down into pure cellulose. The cellulose is then thoroughly mixed in a cuprammonium solution (copper sulphate and ammonia) until a highly viscous solution is obtained. This last is then forced through a spinneret and brought into contact with water, which partly coagulates the cellulose into a filament. At the same time it is stretched to increase the fineness of the filament, while coagulation is then completed by an acid bath.

A number of factors are responsible for the wider commercial production of viscose rayon than by the two other processes. Raw material is available in plenty, while the process is the least subject to the vagaries of the " human

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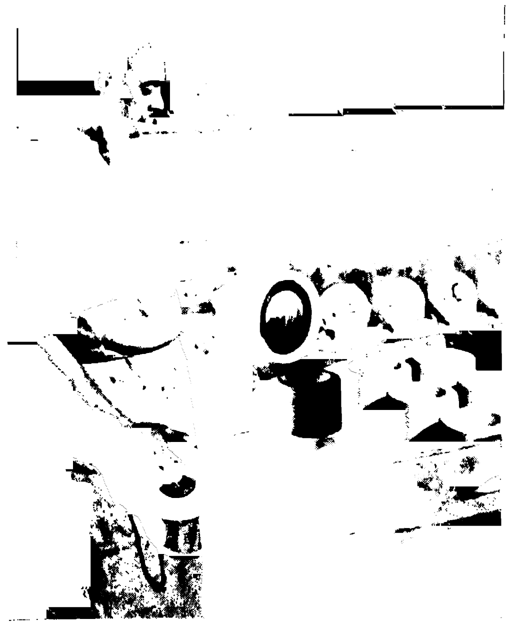
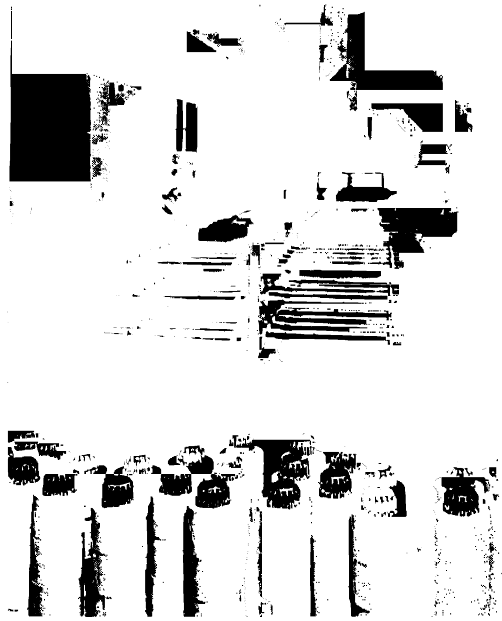
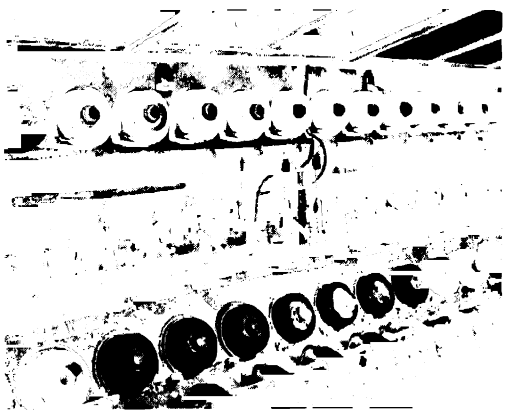


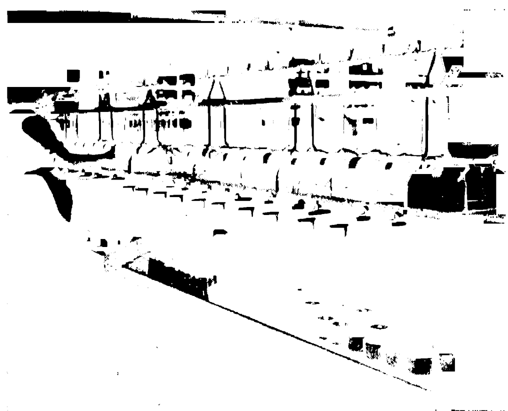
SPINNING—A "Doffer" removing a "Cake" of yarn from a Topham Spinning Box.



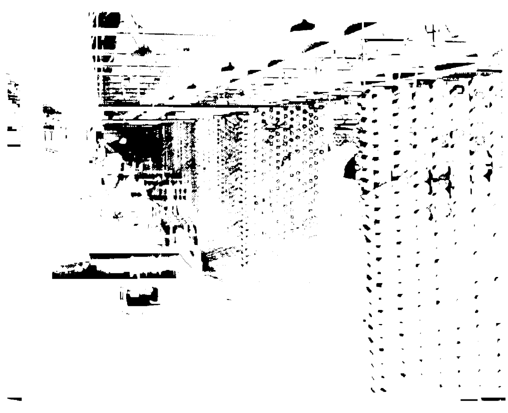
FINISHING—Wrapped yarn in "Cakes" being loaded onto the carriers for further processing.



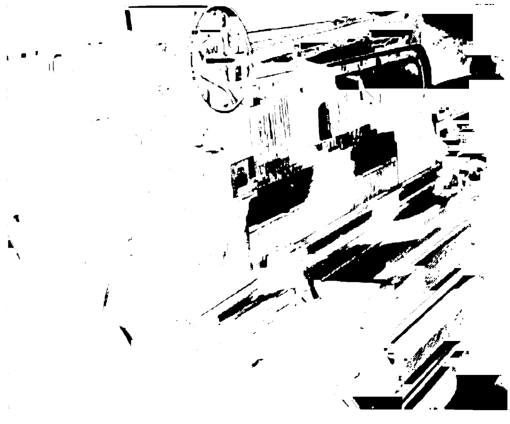
SPINNING—Close-up view of the Spinning operation in viscose production in a Courtauld's factory.



PIRNING, one of many processes by which yarn is put into a suitable form for use in weaving, etc.



WARPING—Here we see length-wise threads of a fabric assembled side by side.



THE LOOM—Weaving on a Dobbie loom in one of Courtauld's Textile Mills.

JOTTINGS

APPLICATIONS FOR SPACE AT THE twenty-fourth International Bicycle and Motor Cycle Show opening at Earl's Court on November 18 already exceed those for the Show abandoned at the outbreak of war. Members' ballots for space will be held at the end of May, and, in addition, inquiries have been received from manufacturers in Austria, Belgium, France, Hungary and Switzerland who want to show motor cycles and accessories.

AS FROM APRIL 22nd 1948 THE Mullard Wireless Service Co., Ltd., will be known as Mullard Electronic Products Ltd. This change of name has been made necessary by the expansion of the Company's activities from that of the purely " wireless " field into other branches of electronics—particularly those with applications in industry, science and communications.

A FINAL ANALYSIS OF THE MOTOR Industry's export figures for March shows that an all-time car shipment record was established by Nuffield Exports Ltd., who despatched 5,070 motor cars during that month. The manner in which car exports have soared during the past twelve months can be gauged from the fact that this figure for one month's shipments alone actually exceeded the total reached by any one manufacturer during the first quarter of 1947.

WE HAVE RECEIVED, FROM THE College of Industrial Management and Engineering, a prospectus setting forth particulars of the aims, objects, examinations and awards of the College. We understand that copies are now available to interested readers. The address is :—Shaftesbury Buildings, Station Street, Birmingham 5.

COLEY BROS. (TOOLS) LTD., advise use that they have at last moved into their new home at " Riverbank Works " Birmingham Factory Centre, Kings Norton,Birmingham 30. Their new 'phone number is KIN 2576 and 2580.

CIBA LTD. HAVE ACQUIRED A CONTROLLING interest in Aero Research Ltd., Duxford, Cambridge, an organisation well known for research work on synthetic resins and for the manufacture of industrial adhesives. The continuation of technological connections, which have existed between the two companies for a considerable time, is thus assured.

DURING MARCH, THE AUSTIN Motor Company exported a total of 5,722 vehicles. This is an all-time record for any British motor manufacturer and it is estimated that the value of these vehicles exceeded £2,000,000. Most of this sum is in hard currency and more than half of it is in terms of U.S.A. dollars.

VICTOR PRODUCTS (WALLSEND) Ltd., have decided to make an immediate and voluntary contribution to the National situation following on the Agreement reached between the Chancellor of the Exchequer and the Federation of British Industries, and have reduced 99% of all prices by 5%.

BRITISH ELECTRONIC PRODUCTS, Ltd., announce that, as from March 15, 1948, their development, engineering, and certain production facilities will occupy new premises at Brereton Road, Bugeley, Staffs.

FLAMEPROOF PROPELLER FANS for use in cellulose paint spraying booths and other places where the air may contain inflammable vapours, propeller fans for industrial and domestic use, and the Aerofoil fan for general ventilation are described in three recent publications issued by Woods of Colchester, Ltd.

A SUCCESSOR TO *MONEL NOTES*, the pre-war publication of Henry Wiggin & Co., Ltd., *Wiggin Nickel Alloys*, the first of the new series to be published monthly, contains articles on the fabrication of combustion chambers for jet propulsion engines, the pickling of steel, searchlights, riveting, hydraulic control pipe lines in aircraft, and electrically heated pads and blankets.

DESCRIPTIONS OF PLANT FOR USE in food factories, jam factories, milk processing, dairies, and fruit juice processing factories are contained in a fully illustrated booklet issued by The A.P.V. Co., Ltd.

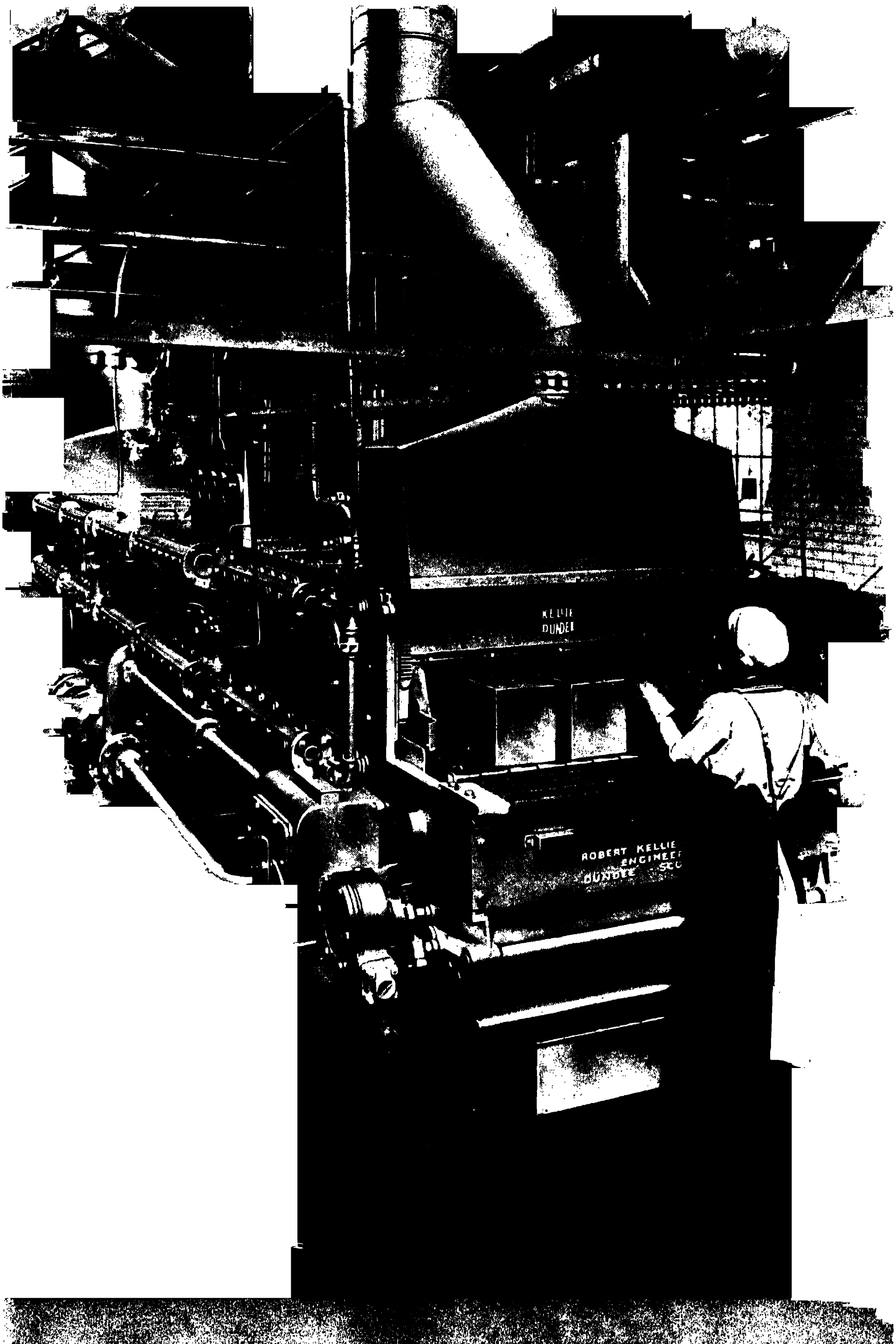
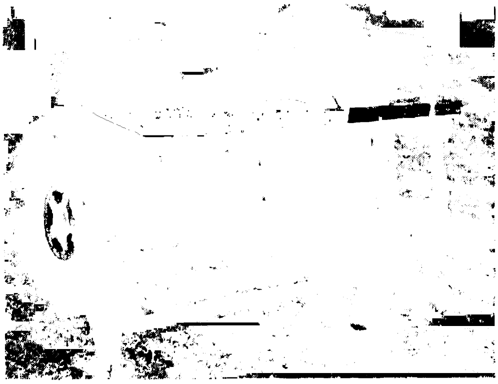
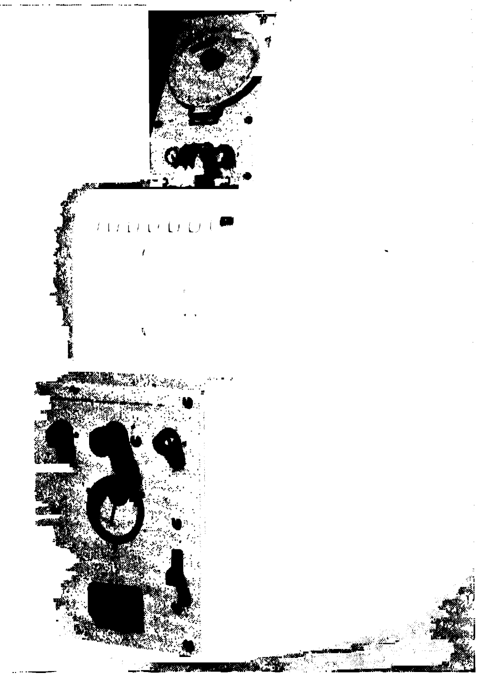


PHOTO *of the* MONTH

Delivery end of the special [illegible] for soaking, de-labelling and rinsing biscuit tins for [illegible] & Co. Ltd. [illegible]

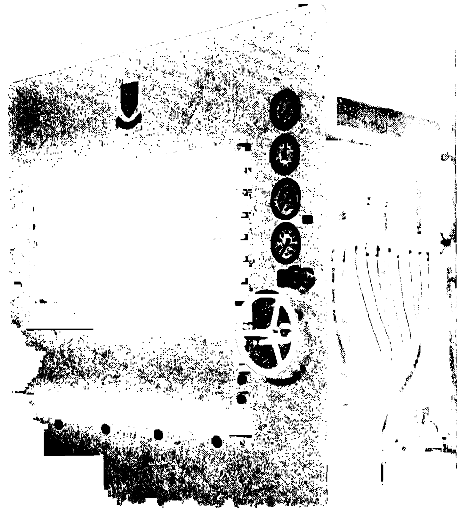


McConnel Mobile Safety Saw.



Racym Rapid Moisture Tester.

Foster, Yates & Thom Press

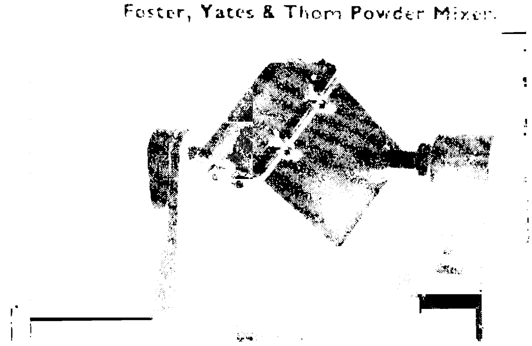


NEW PRODUCT

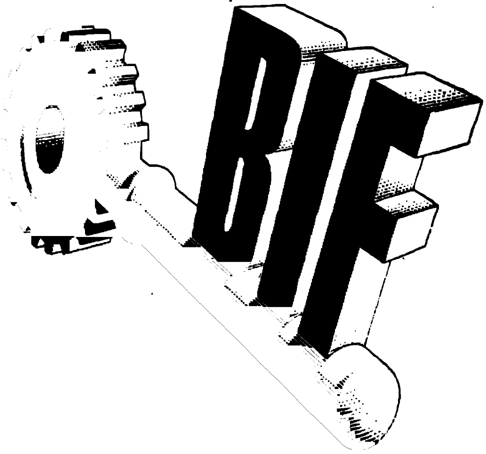
AT this year's B.I.F. at Castle Bromwich a very mixed "bag" of new inventions, ideas and developments was shown. A selection of these is described below. Some of them were in being or on the designer's board before the recent war, but were not manufactured in quantity owing to the general changeover to war production, and also to the inability—in some cases—to secure necessary materials. Others are the result of the inspiration and adaptation of wartime discoveries to peace-time usage.

A crane with many uses was exhibited by F. Taylor & Sons (Manchester) Ltd. of Pendleton. It has been developed from what was originally a mobile crane. Now it combines the attributes and capabilities of other mechanical handling units in the same machine. In a matter of seconds, by easily fitted attachments, the crane becomes a loading shovel with a capacity of $\frac{3}{4}$ cubic yard suitable for handling loose materials, such as coke, coal, ashes, brick, etc., or it becomes an excavator of $\frac{1}{2}$ cubic yard capacity for working consolidated material like earth and clay. Still further, it can become a fork loading machine for handling light, bulky material, such as hay, straw, sugar-beet, etc., and it can be a machine especially suitable for handling and fitting lamp standards, overhead trolley wire poles, vertical girders and stanchions. Strength, great mobility and high manoeuvreability in confined areas are outstanding features of the chassis. Ample power is trans-

Foster, Yates & Thom Powder Mixer.



AT THIS YEAR'S



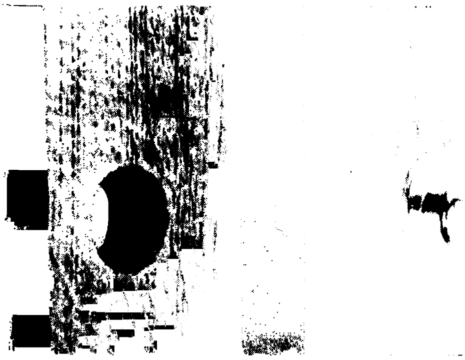
mitted by either a Ford V8 petrol engine or a Perkins P.6 Diesel engine, according to user's requirements, via a 4-speed and reverse gear box and a specially selected reduction gear.

An unusual exhibit was a new wall tile with a suede-like non-reflecting, condensation-resisting finish. An entirely new product made by Spraytex (Manchester) Ltd., " Velvetiles " may be brushed, washed and dry cleaned. Water cannot penetrate the waterproof finish, which also resists petrol, oil and dilute acids and alkali. The tiles have good electrical insulation properties, and are made in a range of 10 colours and 2 types of finish. Standard size is 6 inches by 6 inches. The makers state that these tiles are suitable for the interior decoration of buildings, ships, coaches, aircraft and window displays. They can be fixed easily to any surface, including plaster, paper, wallboard, wood and metal using one coat only of the special adhesive supplied.

An interesting development in wood-working plant can be found in two new machines made by J. & H. Smith, Ltd., of Leeds, which make exclusive use of pressure and gravity die castings, and solid drawn steel tube. Their finish is both unscratchable and non-chipping. The range includes 8 inch and 10 inch, the largest pressure die cast vee pulleys produced in this country. William Allday & Co. Ltd. of Stourport, Worcs., are exhibiting a new jig-saw machine that will cut plywood, plastic, aluminium, cast iron and mild steel when fitted with appropriate saw blades. An entirely new machine introduced during the past year is the McConnel mobile safety saw manufactured by F W. McConnel Ltd. of Martley, Worcester. It is claimed that this machine about halves the cost of cutting pitprops, posts, etc., while doubling the output. This saw incorporates an entirely new parallel link action swinging table that reduces the effort required, increases output and enables unskilled labour to be used.

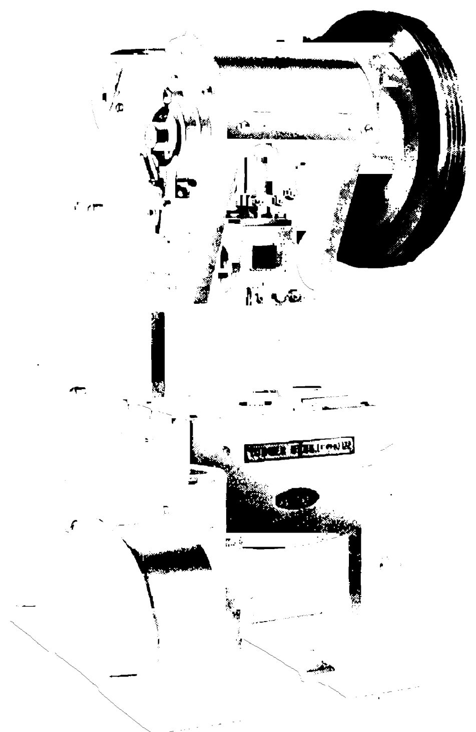
An unusual combination of file and saw exists in the " Abrafile " made by Abrasive Tools Ltd. of 170-173, Piccadilly, London, W.1. Made of specially treated steel wire, this tool has non-clogging teeth. As a fret-saw it is especially useful in filing or cutting intricate shapes, irregular holes in metal or filing deep slots. Unlike hacksaw blades or thin files, it is non-directional, i.e. the cut can be diverted at any time to any angle without increasing the size of the slot at the turning point. It is claimed to cut faster than an ordinary file, and, as teeth are cut around the entire circumference, it is only necessary to turn the file a fraction to bring a new set of teeth into action.

Two new enamels are displayed. One, a synthetic product, gives finer finishes with fewer coats. Made by Donald Macpherson & Co. Ltd., of Manchester, 15, the enamel is dust free in one hour. and bone dry in four hours without augmented heat. It is immune



to oil, water and impact. The second product is a heat-resisting enamel claimed to be the nearest point equivalent to vitreous enamel, but without the latter's brittleness. It will not chip, and withstands hard usage for very long periods of service. This enamel gives a brilliant glossy white surface that will not discolour even when exposed to very high temperatures, while it is odourless when applied to a product kept in a confined space. It is also available in aluminium and certain other colours. Makers are Jenson & Nicholson Ltd. of London, E.15.

Several developments of interest to the plastics industry were shown. One, exhibited for the first time, was a di-electric pellet heater for the moulding industry. This embodies a new principle designed to maintain constant power output at any figure up to the maximum output of the equipment. A device, for which patents have been applied, is incorporated by means of which power applied to the material remains constant throughout the heating cycle despite invariable variation of the electrical properties of the load that occurs during this period. The loading can thus be set at its maximum value even in the initial stages of the heating cycle, without any fear of a subsequent increase causing the equipment to become overloaded. The method employed makes use of variations in the electrical circuits, and causes automatic movement of the adjustable electrodes to maintain output to the work under treatment. Electrode size is 12 inches by 9 inches, and, subject to certain limitations, the equipment will heat 40 ozs. of general purpose phenol moulding material to 100 degrees Centigrade in 2 minutes. Tests made on typical moulding material show production increases of up to 60 per cent. The heater is made by Wild-Barfield Electric Furnaces Ltd. of Watford By-pass, Herts.



Injection Moulding Machine

From Projectile & Engineering Co. Ltd. of London, S.W.8. comes an injection moulding machine built on a three-unit principle, i.e. main plate and operating assembly, hydraulic control base, and electric and heat control which ensure easy maintenance. Another new feature is combined automatic heat input and temperature control for the material heating cylinder, which is of solid stainless steel with cartridge heaters.

Cellon Ltd. of Kingston-on-Thames showed a new protective coat for metals. This is a specially prepared plastic which is applied by spray or roller under controlled conditions of heat and humidity. A film of .001 inch to .002 inch is recommended, according to the purpose for which it is intended. The material air dries in 20/30 minutes, and has an extremely high tensile strength coupled with great elasticity. The coating adheres tightly to the surface of the metal like a thin skin, but when its purpose has been served it can be removed easily, without the application of solvents, by merely lifting a corner and peeling off. It protects metal indefinitely from tarnish and scratching, and is sufficiently tough and elastic to allow a polished sheet to be pressed before the coating is removed.

Ferro-Enamels of Wolverhampton exhibited the results of further development in low-temperature groundcoats for steel. Instead of firing groundcoat at 860 degrees Centigrade and white enamel at 40 degrees less, this new groundcoat and the firm's white enamel frits can be fired together, thus cutting out all time lost while the furnace temperature is being adjusted, and enabling a higher output per furnace hour.

Three new tools were shown by Donald Ross & Partners Ltd. of 88 Regent Street London, W.1. One, the "Twinner Vice," is claimed to be the only tool of its kind in the world. This is a combined welding jig and

manipulator for universal use. It solves setting-up problems for welding, eliminates improvision from set-ups, and cuts down the operator's time. The "Twinner Multi-Jigset" is a new device for holing work in position, for welding, fitting, drilling, riveting, etc. It may perhaps best be described as mechanical hands, and can also be used for building up a great variety of bench jigs for welding frames, tubular structures, etc. The "Twinner Wire Soldering Machine" has been specially designed for butt soldering copper wire and strip for the cable and electrical industries. It makes clean joints quickly by unskilled labour. In effect, it is a new soldering technique with many possible applications.

A patented centre finder of considerable interest to engineers was exhibited by Geo. H. Alexander Machinery Ltd. of Birmingham, 4. This enables a marked-out centre to be spotted to give a precisely located centre large enough to drill in a drilling or milling machine. It has been designed to meet the need of small press tool makers whose work is insufficient to warrant the installation of an expensive jig-boring machine, but obviously it will also have applications in large works and factories.

A most interesting effort to meet the needs of blind engineers, toolmakers, instrument makers, etc., was seen on the stand of Moore & Wright (Sheffield) Ltd. This included micrometers and bevel protractors based on standard patterns, but having Braille characters on relatively large drums which, however, are still of convenient size. The system employed can be fitted as a standard attachment to any micrometer or micrometer head.

Sealocrete Products Ltd. of London, W.8. had something new in cement flooring. This is a patented cork cement flooring composition in which liquid colours have been incorporated. The floor is warm, silent, waterproof and colourful, and can be used on any type of prepared base. The composition is supplied packed in sacks, and only the addition of water is required to prepare the material for laying. It can also be used for rendering walls to make them warm and noiseless, and, at the same time, the product had considerable anti-condensation properties.

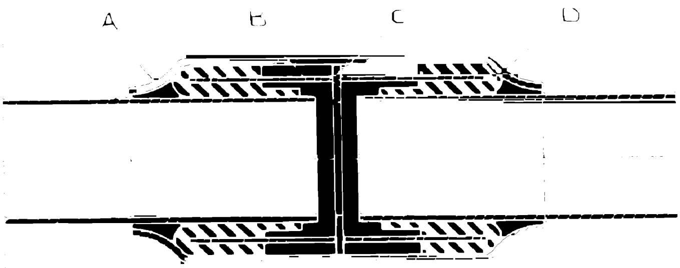
Two interesting types of measuring apparatus were exhibited. One, from Ether Ltd. of Birmingham, 24, is an electronically operated potentiometer recorder which, claim the makers, is in advance and design superior to that of any similar instrument on the market. The electronic operation being completely without moving parts of any description, it is the only instrument in the world having such advantages. Radio Heaters Ltd. of Wokingham have a new type of moisture tester in which the pan of a special balance is suspended between the electrodes of a radio frequency oven. The indicating dial on the balance is calibrated directly in grams, the balance point being indicated by 2 lamps. This apparatus enables moisture tests on many materials to be shortened from hours to minutes. Wood flour previously requiring 16 hours now takes only 3 minutes, while it is suitable for use with continuous radio ovens for man specialised drying operations on powder and granular materials. Among other important uses of this moisture testing apparatus are in connection with the rapid continuous heating of P.V.C. chips for extrusion and callendering, thus avoiding unnecessary evaporation of the plasticiser, and also in the dextrination of starch and the preparation of powders prior to packing.

Power presses

New type power presses were shown by Turner Bros. (Birmingham) Ltd. of Birmingham 19. These are in 6, 10 and 20 sizes, and are of fabricated construction, entirely free from welding, and are capable of taking a very heavy overload, while being practically unbreakable. The 20 ton press, geared and ungeared, is now available, as also is the 6 ton model, with fixed and adjustable strokes, and with roll feed. Similar advantages in all models will shortly be available, and delivery dates are from 2 to 10 weeks, according to the model selected. Foster, Yates & Thom Ltd. of Blackburn showed a bobbin press designed to meet the requirements of instrument wire manufacturers. This new bobbin assembly press will handle the barrels and metal or plastic flanges of bobbins at the rate of 20 per minute, and marks an entirely new departure in this field.

An important contribution to the manufacture of tea was seen in a machine produced by Marshall's Tea Machinery Co. Ltd., of Gainsborough, which simplifies rolling room layout and procedure. Requiring no heating of the leaf, this machine reduces rolling time, while giving quicker and more uniform fermentation, thus leading to closer operational control. Power requirements are reduced, and a greater percentage of the leaf cells are ruptured without adversely affecting the appearance of the tea. The process is quite unknown overseas, no similar machine having been produced.

A new boiler designed for use by British



Railways (Midland Section) in railway rest rooms was shown by James Stott & Co. (Engineers) Ltd. of Oldham. It combines the virtues of the constant flow type and the reserve type of water boiler, while an outstanding feature is that once the boiler is heated up—it operates on 2.5 cubic feet of gas per hour—the water can be easily kept at boiling point. On account of the low gas consumption the boiler need never be turned off, thus ensuring a permanent supply of boiling water.

Another model of vastly different type and use is the electrode boiler with which steam can be raised in 5 to 7 minutes by the mere closing of a switch. Exhibited by G.W.B. Electric Furnaces Ltd. of Watford, the unit is completely self-contained, thus obviating the necessity for flues, chimneys, coal storage, ash removal and stokers services. Pressure is controlled automatically, and the auto load control device ensures that the amount of steam raised does not exceed the demand. The efficiency of these boilers is 97 to 99 per cent.

Tractors (London) Ltd. of Barnet had on show a completely redesigned tractor. The familiar two-wheel type has been developed into a light four-wheel model. It is fitted with a 6 h.p. Douglas air-cooled engine, with governor. The steering handles of the old models have been replaced by a front axle pivotally mounted, giving an overall length of 5 feet 9 inches. The seat is above the engine, and just in front is a steering wheel operated through a quadrant. The foot and hand brakes, and accelerator are conveniently placed on the small platform, while joy-stick control from the centrifugal clutch permits the rear wheel to be engaged or disengaged independently, and also affects reverse travel. This firm is experimenting with radio controlled tractors.

Electrically driven, battery operated industrial trucks were exhibited by Steel & Co. Ltd. of Sunderland. Features include load carrying low-lift stillage, high lift tiering and tractors that incorporate an entirely new and what is claimed to be a revolutionary system of steering. This is by the use of a steering platform which adjusts itself in accordance with the natural poise of the body when driving straight ahead or when negotiating bends or corners. The advantages claimed include extremely light and sensitive steering control, perfect and stable body poise, positive braking and speed control positions giving support and security to the operator under all conditions. Body weight is evenly distributed at all times, while there is no out of balance position. Operator fatigue is thus reduced to an absolute minimum.

Fisher & Ludlow Ltd. of Smethwick exhibited a flowline conveyor system with two new features. One is the equipment whereby the standard flowline belt conveyor can be converted to an inclined belt for conveying materials from one level to another. The second is the use of a flowline system with troughed belts. This has wide application in the food packaging industry and the system is claimed to be unique.

The incorporation of granulated peat for insulation purposes is the beginning of a new trend in insulation. This was shown by British Made Electrics Ltd. of Broxburn, West Lothian. Peat is now used in all thermal heaters made by this firm in place of cork. A series of exhaustive tests has shown that peat retains heat 25 per cent. longer than cork, consequently the saving of current in a thermostatically controlled electric heater is considerable. The packing density of peat is 6.75 lbs. per cubic foot and, unlike cork, it is unnecessary to take precautions after packing against expansion with subsequent pressure on fittings and inner containers. Peat granules will not support fungoid growth of any description.

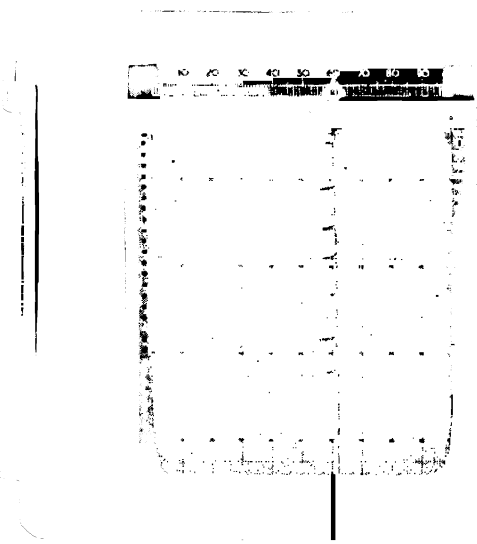
A revolutionary type of pipe joint employing entirely new principles in connecting pipes manufactured from any material—copper, lead, iron, glass, plastic, etc.—was exhibited by Projects & Development Ltd., of Blackburn. In the design no use is made of screwed threads or any type of locking device, thus permitting the use of much lighter gauge tube than is normally required.

A general purpose lamp, burning ordinary kerosene, fitted with internal reflectors top and bottom comes from the Tilley Lamp Co. Ltd. of London, W.1. A light of 500 mean-reflected candle power is achieved. In addition, the glass cylinder can be supplied with a semi-circular mirrored surface so that the lamp can function as a small flood-light.

A spring-lock safety device for gas taps was exhibited by William Whitehouse & Co. Ltd., of Birmingham, 4. The makers claim that it is automatic and foolproof in whatever position the taps are used, as spring loading renders it impossible for the taps to be turned on accidentally. George Salter & Co. Ltd., of West Bromwich showed what they claim to be the greatest advance during the past 50 years in spring balance manufacture. This is a shock absorbing indicator which, by independent springing, relieves the strain on the rack and pinion under the shock of loading and unloading.

Two interesting developments in the sphere of locks were displayed. One comes from Ingersoll Locks Ltd. of South Ruislip, and takes the form of a 10 lever rim automatic deadlock the fruit of 3 years of design and experiment. It has, say the makers, overcome all the weak features of ordinary locks and is 100 per cent. security fact. The opinion of the greatest experts in lock picking in two continents is that it is unpickable. Designed to fit in with modern door thicknesses, the patented staple has a shear strength of 2 tons. The 10 levers afford more than one million differs per key section, so that every purchaser is guaranteed a different key combination.

The second new interior door lock comes from the Whitliff Corporation Ltd., of London, W.6. This "Clip-Lock" is claimed to incorporate an entirely new principle of lock construction. The lock and lock furniture form one compact unit, the furniture spindle being an integral part of the lock mechanism. A flat key is inserted in the lock underneath the handle, invisible to casual observation. The mechanism is locked by merely withdrawing the key, the handles then being disconnected from the bolt. An important feature is that the time needed for the preparation of the door and fitting of the lock is reduced by as much as 75 per cent. Only 2 holes are required—one in the face, the other in the edge of the door. The lock can be fitted to any thickness of door between 1 and 2 inches, and it is silent in operation. The handles are finished in B.M.A., chrome or nickel plate.



An electronically operated potentiometer recorder claimed to be in advance of anything previously put on the market by an English firm. See also pages 58-64.

MISCELLANY

PROFESSORS GO VISITING

The United Steel Companies Limited recently invited fourteen Professors of Mechanical Engineering from eleven different Universities to visit their works in Sheffield and Scunthorpe. The visit, which lasted four days (April 12th-15th), was designed to help bridge the gap between industry and the Universities by giving the University men an opportunity of seeing the special problems of the Steel Industry and the steel men the chance of discussing with the Professors the latest ideas on engineering.

Discussions were arranged on the dependence of metallurgical developments on engineering research, with particular reference to such problems as the handling of scrap and the flow of gases in open hearth furnaces.

A discussion on Industrial Research was opened by Sir Charles Goodeve, F.R.S., Director of the British Iron and Steel Research Association.

QUALITY CONTROL

The importance of quality control in modern methods of production cannot be too strongly emphasised. B.S. 600, Application of statistical methods to industrial standardisation and quality control, published in 1935 became established as a classical work on this subject.

Unfortunately, during the war, the standing type was "blitzed" so the stock became exhausted and it was not possible to bring out another edition. The type has now been re-set and once again copies are available.

This standard explains why a statistical technique is needed for the solution of problems of specification, standardisation and routine process control. Specimen problems are discussed to introduce the common statistical measures. Questions of sampling are examined and guidance on sampling is given. Methods of controlling the quality of product are described, either by examining samples taken from batches or consignments or by routine testing in the course of manufacture. It shows how both methods can form the basis of the use of certification marks and includes statistical methods needed in industrial investigation.

This invaluable publication. British Standard 600, Application of statistical methods to industrial standardisation and quality control is priced at 12 shillings and sixpence and may be obtained from the British Standards Institution, 24 Victoria Street, London, S.W.1. or their sales agents in overseas countries.

B.S.I. YEARBOOK

The Yearbook of the British Standards Institution, which has just been published, gives a subject index and a synopsis of each of the 1,400 British Standards now current. These standards have been prepared by representative committees of 50 different industries.

The Yearbook includes lists of members of the General Council, the Divisional Councils and the Industry Committee of the Institution as well as other useful information about its work.

The Yearbook, price 3/6 post free, can be obtained from the Publications Sales Department, British Standards Institution, 24, Victoria Street, London, S.W.1.

BICYCLE PRICES "FROZEN"

Bicycle and motor cycle manufacturers have agreed to fix prices at to-day's levels provided there are no increases in production or distribution costs outside their control.

In reporting the decision to the Federation of British Industries, Mr. H. R. Watling, director of the British Cycle and Motor Cycle Manufacturers and Traders Union Ltd., suggests that future increases in prices could

be avoided by an increase of working hours for everybody; a reduction in Government expenditure and in the Civil Service, thereby releasing workers; the reduction of loss from damage and elimination of theft; more efficient transport from the docks and on the railways; and a more energetic policy to create, maintain—and when created, to keep open—overseas markets.

It is also suggested that a special enquiry might be made into the costs of power, local rates and transport.

EVOKING JOB INTEREST

Too often, the rather uninteresting product upon which a worker is engaged bears no obvious relationship to the finally exported article, and a further difficulty is to relate the effort in making and exporting these articles themselves to the imports of food and other supplies which the exports enable us as a nation to buy.

It is especially difficult to bring this home to workers engaged on semi-finished components, such as iron castings. For this reason, John Harper & Co., Ltd., the ironfounders of Willenhall, Staffs., are planning a series of exhibitions to show workers what happens to iron castings after they have left the works, and how these castings are helping directly in export.

For the first display the firm chose typewriter castings; it so happens that Harpers are supplying the whole of the castings for all manufacturers in the British typewriter industry. Over 60 workers are engaged solely in this work. The exhibit shows the component castings made by the firm on high-precision quantity production lines.

British typewriter manufacturers face a home demand of some 400,000 machines per year, but have been asked to concentrate their energies upon machines for export. During the past year they together produced 303 tons of typewriters, valued at £391,140, for overseas markets. These exports represent the complete rations of butter, tea, bacon and sugar for 7,040,520 persons for a week, or for 134,394 persons for a whole year.

By bringing home a fact like this, and making it clear that the workers in this one foundry are themselves solely responsible for the iron castings which make it possible, Harpers hope to give them more interest in their job and to correlate their work directly with the export drive.

THOS. W. WARD BUY WAGON WORKS

Imperial Works of D. G. Hall & Co. Ltd., Coverack Road, Newport (Mon.), has been purchased as a going concern by Thos. W. Ward Ltd.

The works, which are situated on the bank of the River Usk, occupy a site of approximately 4 acres and have been operated for some years on the building and repair of railway wagons.

Facilities include: Log Mill, Steel Wagon Repair Shop, Press Shop, Fitting Shop, Wagon Shop, Wheel Shop, etc.

Ward's intend to develop to the full the scope of the various workshops. Wagon repairing will be given first priority in view of its urgent necessity for the efficient operation of British Railways, and repairs to railway wagons of all types, both steel and wood, will be undertaken.

We are informed that Thos W. Ward will, on the final take over date, offer re-employment to all workmen.

I.E.E. THURSTON COMPETITION

The above Competition was inaugurated in July, 1947, to encourage inventiveness and ideas of benefit to the industry. Dr. Thurston, M.B.E., M.I.Mech.E., F.R.Ae.S., the Association's Adviser on Patents, generously donated an annual cash prize of £10 for the invention submitted and judged to be the most valuable contribution to the advancement of (a) utilisation of electricity (b) the improvement of distribution technique, or (c) installation technique. Since the introduction of the Competition, Dr. Thurston has increased its value by presenting a Silver Trophy for annual competition which the winner will hold for one year. The Competition is limited to the membership of the A.S.E.E.

The Competition Committee have now announced their decision in connection with the first Competition of the series and have awarded the prize to:—

Mr. C. G. Crampton, Bearsted, Kent, for his invention Patent No. 27509/46 "A Magnetic Centrifugal Switch" designed mainly for use on single-phase motors, to cut out the starting winding, with or without a condenser.

The Trophy and cheque will be presented to the winner at the opening meeting of the London lecture Session in October next, at the Lighting Service Bureau, London, W.C.2.

Ether Ltd., is the fruit of one man's careful planning, and the story outlined in the following pages is one of design and development that has overcome all obstacles until the firm, which started in 1923 with only £300 capital and only 2 employees, is now one of the principal concerns in its particular line of business.

Temperature Recorders

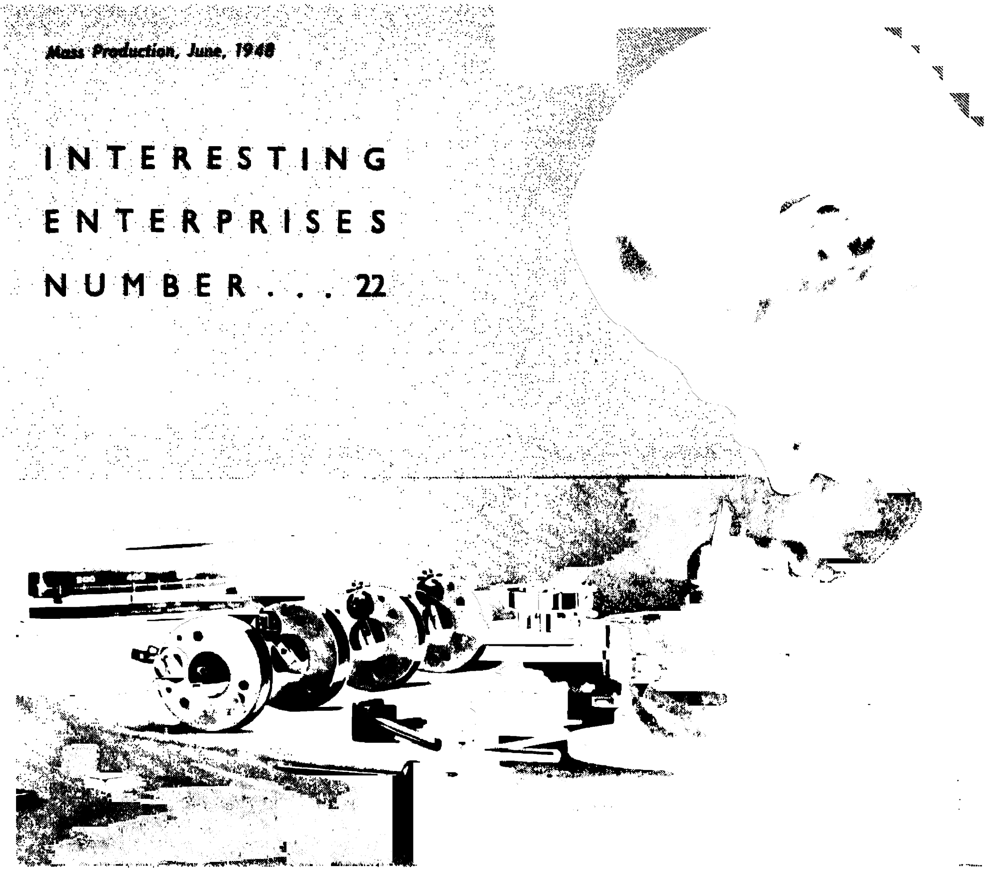
OUR visit to one of the most remarkable concerns in the country was a direct consequence of the British Industries Fair at Castle Bromwich, Birmingham. On our way to the Fair we passed through the factory area at Tyburn Road, Erdington, and were intrigued by the name Ether Ltd. on a single-story works. With visions of a plant manufacturing the organic solvent and anaesthetic we wondered at the compactness of the buildings without a sign of chemical plant. At the Fair we saw the firm's exhibit, and, as a result, called later at their headquarters, where, we met Mr. H. A. Stevenson, the Managing Director and Founder, a combination of scientist, inventor and business man.

With due respect to all others associated with this thriving enterprise, we felt we were talking to a master of his craft. He is not only enthusiastic about his products, but infects others with this desirable trait. Indeed, he talked electronic devices in so simple but informative a manner that it was with difficulty we turned to the purpose of our visit, which was to give readers of *Mass Production* some idea of the services this firm has been rendering to industry since 1923.

It is a story of design and development that has overcome all obstacles until Ether, Ltd. is now one of the world's principal concerns in its own sphere of productions. Like many of the most successful manufacturing concerns of this and other countries Ether Ltd. is the fruit of one man's careful planning. It all began in 1923 when H. A. Stevenson, formerly with Marconi, founded a business to produce radio equipment and electronic devices. His capital was only £300 and he had 2 employees. The works began near their present location in what is now the Heat Treatment Shop of Birlec Ltd., the makers of electric furnaces, etc. Soon Ether Ltd. crossed the road into a works built on the present site.

From its earliest days the firm has been characterised by the meticulous accuracy in operation of its products, for excellence of workmanship, and, what is even more important, for the skill in equipment design which, even then, was ahead of its competitors. In 1928, when a slump in radio sales set in, Mr. Stevenson decided to abandon production in the radio sphere, and to concentrate on the manufacture of temperature measuring instruments. He set himself the task of designing and producing technical

INTERESTING ENTERPRISES NUMBER . . . 22



industrial equipment of such accuracy in measurement and recording as would result in the manufacture of instruments of the first quality, at least equal to the best and better than most. For ten years from 1928 to 1938 experimental work and research, coupled with an intimate study of the varied requirements of industry, was carried out. By this time Ether Ltd. had developed in large numbers a line of heat control instruments.

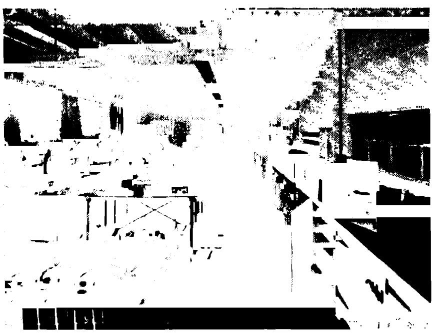
In 1939, at the opening of the Second World War, the firm was asked by the Government to continue production of its highly essential apparatus, and a new works was built. One night in July, 1942, during a particularly vicious raid by the Luftwaffe, the new works was entirely destroyed, with all its plant and equipment.

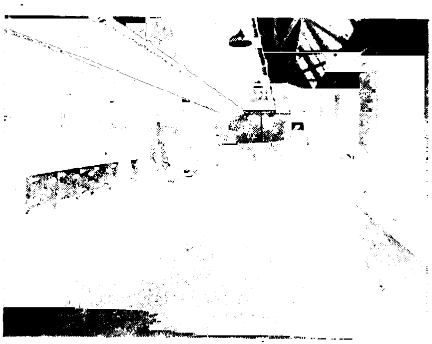
"We were given the highest priority by the Machine Tool Control and Air Ministry in rebuilding," Mr. Stevenenson told us, "and with everyone working hard we rebuilt and got a new works on the same site in operation within 3 months. In fact, from one angle, the wrecking of our old works was an advantage. We hadn't a thing left, so that all our re-equipment was with the very latest and most modern types of machine tools. We haven't an old machine in the place," he commented, "which has enabled us to improve our products in many ways."

"Production increased considerably, and for the rest of the war we were making recorder automatic controlling equipment for the control of industrial furnaces and heating appliances. In addition, for a considerable time, we had been producing prototype instruments embodying electronic action, which gives exceptionally speedy response in special heat treatment processes."

Many of the world's prominent scientists and engineers have entered the doors of Ether Ltd., and have seen the instruments produced and tested in the laboratories and works. The firm readily acknowledges the many helpful suggestions made by them.

Mr. Stevenson then learned that some of his work had been on parallel lines with that conducted by the Wheelco Instrument Co., of Chicago, U.S.A., who held certain British patents for electronic apparatus, so Ether Ltd. negotiated a friendly arrangement whereby the Birmingham firm took over the manufacture of Wheelco products in this country, and their sale throughout the world, except in the American continent. For their





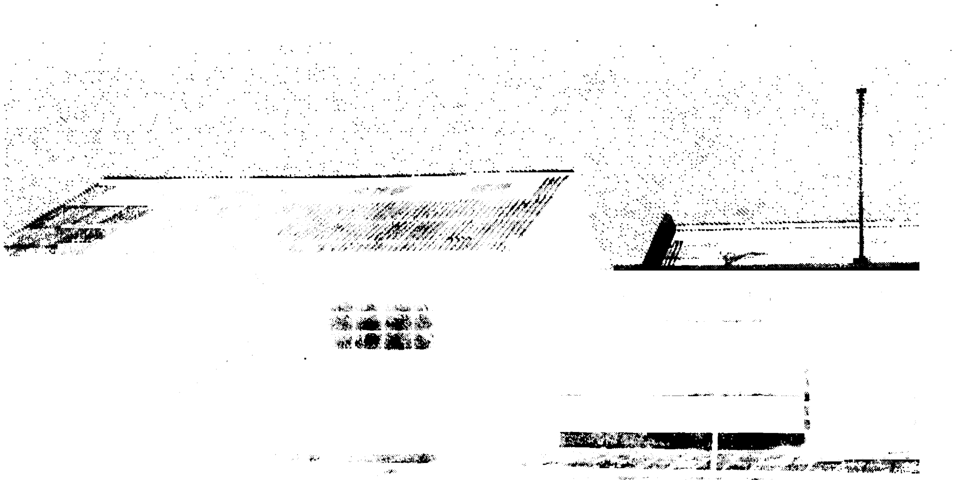
part Ether Ltd. arranged to sell to the American concern certain equipment and rights—the result of its own development—for the production of magnetic amplifiers that dispense with the use of valves, which is highly desirable for industrial electronic devices. These are definitely in advance of anything produced in the United States. The firm exhibited its Electronically-Operated Potentiometer Recorder at the British Industries Fair.

We enquired as to the method whereby this instrument operates. It embodies the very latest principles in magnetic amplification, and the transformation of minute D.C. currents into A.C., employing no moving parts whatsoever. As compared with this outstanding achievement of British industry, the most up-to-date instrument made in the United States employs vibrating reeds or some such mechanical device, a constant source of trouble and less efficient in accuracy in its performance. In addition to recording temperatures, this instrument is also capable of controlling electric, gas or oil-fired furnaces within close limits, and can be adapted to various forms of control, including On/Off, multi-stage and proportional control. This

1—Interior of works showing corner of painting shop with infra-red dust proof drying cupboards.

2—Corner of Assembly Department, where the instruments are assembled, prior to calibration.

3—Interior of thermocouple department, devoted solely to the production of new thermocouples, and the repair of those which have deteriorated due to long service.



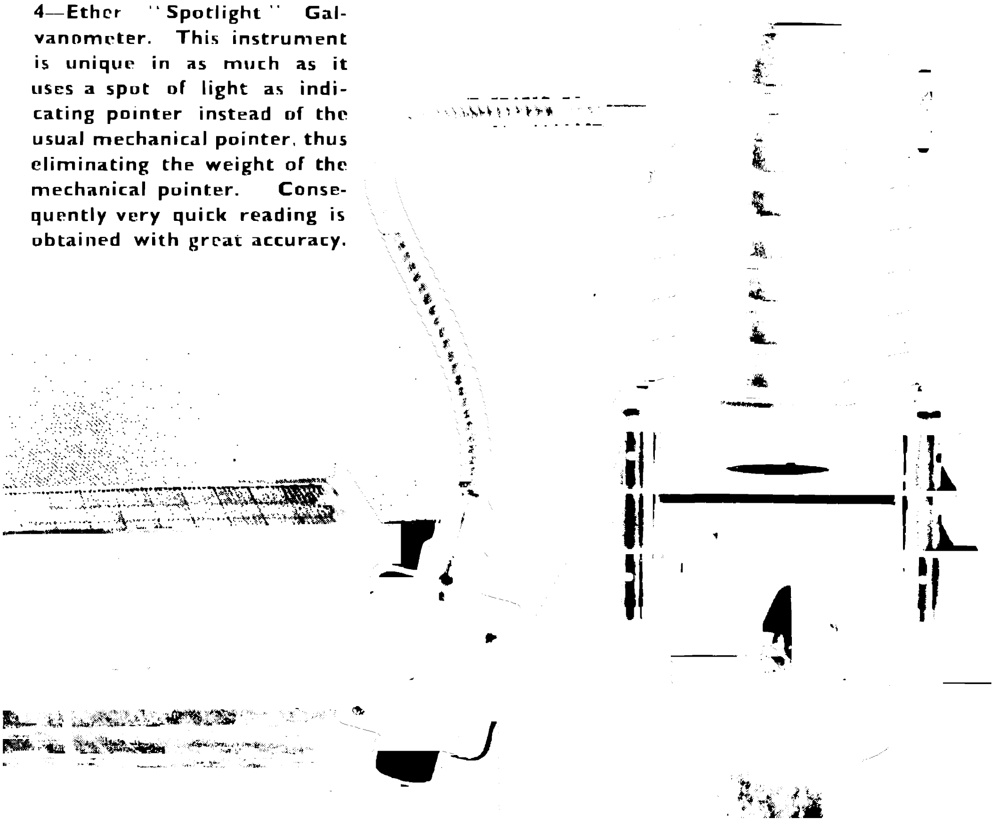
last has recently been patented by Mr. Stevenson. It will control any source of energy so that the heat losses from a furnace are precisely balanced by the energy delivered to it, and it handles with ease the most fluctuating conditions in industrial processes. Extremely sensitive, it has a full scale recorder 10 inches wide for one-thousandth of a volt. On such a range it detects changes of the order of 2 microvolts, and will travel the scale length of 10 inches in 1 second.

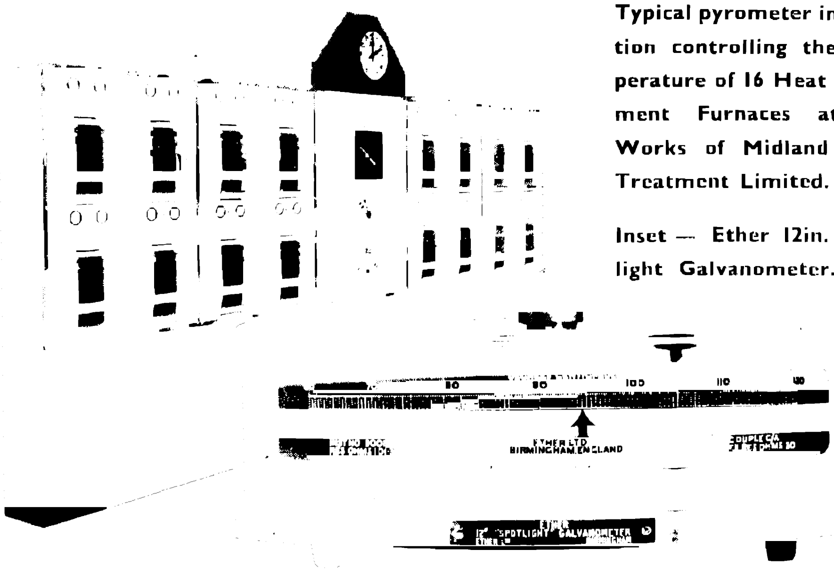
At this point we stood looking into the works from the Managing Director's office windows. The place resembled a large laboratory rather than the noisy workshops and departments of an industrial concern. Operatives were carefully assembling parts on benches and tables of the type generally associated with research laboratories. The work demands little manual effort, but requires keen perception and attention to detail. Indeed, when we heard that accuracy of recording in many instruments has to be in the region of one-millionth of a watt, there is no wonder that the inspection system at this works is of the most rigorous, searching and exacting type. Ether Ltd. is most definitely not a firm where slipshod work passes. Only the best has even a hope of being accepted.

Mr. Stevenson was good enough to tell us of a further interesting electronic device in production called the " Flame-o-trol," which is an efficient combustion safeguard. It utilises the electrical conductivity of a flame to close an electronic circuit. Immediately the flame dies, the electronic circuit de-energises a fuel valve, cutting off the supply to the flame, and thus preventing an explosion. This device can be made in many forms. It is possible to relight gas automatically after allowing a suitable period of purging the apparatus. It has many other features that give full protection to combustion conditions. The sensitive element can consist of an electrode, and, in certain circumstances, a blue sensitive photocell is used when the flame tip is too high for the convenient employment of an electrode. This cell is unique in that it will differentiate between the temperature of the furnace walls and that of the flame.

However, the firm makes many other types of instruments for industrial and research purposes. They produce one, called the " Indicator," that will indicate and control temperatures from — 200 degrees Centigrade to 2,000 degrees Centigrade, combined with

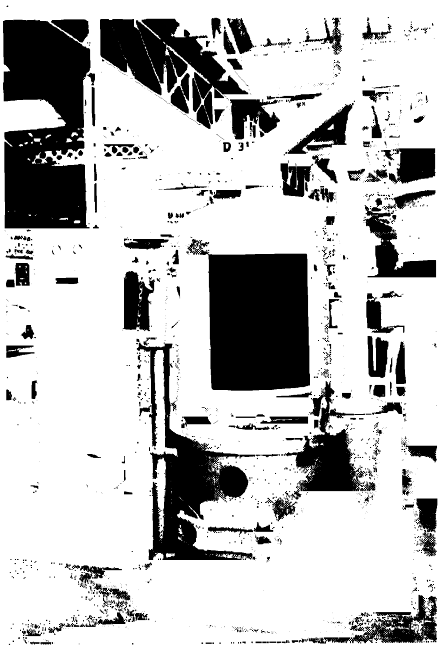
4—Ether " Spotlight " Galvanometer. This instrument is unique in as much as it uses a spot of light as indicating pointer instead of the usual mechanical pointer, thus eliminating the weight of the mechanical pointer. Consequently very quick reading is obtained with great accuracy.





Typical pyrometer installation controlling the temperature of 16 Heat Treatment Furnaces at the Works of Midland Heat Treatment Limited.

Inset — Ether 12in. Spotlight Galvanometer.



An Ether Indicating Controller operated in conjunction with an I.C.I. Salt Bath so that the salts are maintained within plus or minus 5 degrees at a working temperature of 900 deg. C.

reliable and trouble-free operation. Three efficient electrical measuring systems are provided, each the most appropriate for the required temperature range.

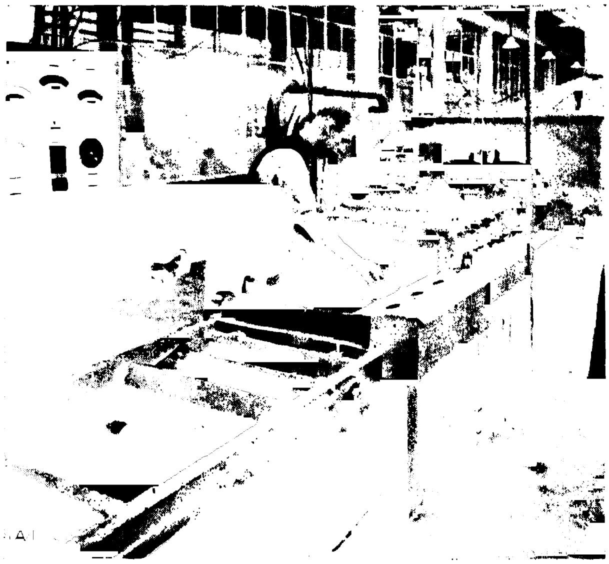
1. Cross Coil for low temperatures.

2. Double-Pivoted Moving Coil for Medium and high temperatures.

3. Taut Suspension Moving Coil for special applications.

Recording is by continuous chart, and many forms of recording are possible, from the simple single point, through two and three point, two and three colour instruments, to a model that will also automatically control temperature. Signal lamps are self-contained, and control is to very fine limits. Industries using the "Indicator" include drop forging, glass melting, brick making, diecasting, heat treatment of metals, malleable annealing, chemical processes, plastic moulding, food and rubber processing, refrigeration, power stations and steam temperature control, etc.

We learned that temperature devices used in conjunction with some of the instruments mentioned may be in the form of thermocouples generating electricity against temperature. The output of such a device is in the region of one-thirty-thousandth of a volt. Where the temperature is too high for the materials to withstand such exposure, Ether Ltd. have produced an instrument called the



Here, in the left background behind the operator may be seen the complete Control Panel embodying Ether Recording Controller which controls the temperature of a Bright Annealing Furnace for annealing small metal parts at the Works of Tucker Eyelet Co., Birmingham.

" Forgemaster " Radiation Pyrometer, which measures temperatures from about 700 degrees Centigrade to 2,500 degrees Centigrade.

One cannot but be impressed, as were so many visitors to the British Industries Fair, at the almost extraordinary devices made by this firm. As an example of furnishing a suitable instrument " for the job," irrespective of how unusual it may chance to be, they have a multi-position controller designed specially for use in connection with fast furnaces, where rapid rate of temperature change occurs, and where it is necessary to maintain exceedingly close control of a type superior to that of the usual two-position control systems.

At this point we enquired as to the sales situation, especially that relating to exports overseas. Mr. Stevenson told us that the production of instruments is now considerable. The sales programme is being dictated throughout the European market by the ability of the various countries to obtain currency. In general, arrangements have acted favourably for Ether Ltd. As an example, Sweden, with which the American Wheelco Co. did a substantial business, was faced with dollar difficulties in 1947, but these troubles are no longer experienced now that the European markets fall within the Birmingham concern's area of supply. Ether Ltd. now exports 65 per cent. of the output of its own products, and up to 85 per cent, of those it manufactures under the arrangement with its American friends.

Not all the measuring instruments made by Ether Ltd. are of the fixed panel, wall or large type. For instance, they produce a portable " Longscale " potentiometer that, nevertheless, is a precision instrument embodying many novel features, which enable works electricians and engineers to carry out accurate tests on thermo-electric pyrometers while in operation, with a precision and speed not hitherto possible, no calculations or special knowledge of potentiometer operation being required. The special circuit employed eliminates all switching during tests, the temperatures being read direct. Corrections for variation in air temperature are eliminated, and a complete test is only a matter of seconds. It is so simple in operation that it is ready when the lid is opened, and no levelling is needed. The two scales are 24 inches long. One is calibrated directly in temperature, the other records millivolts. It is accurate to less than 1 degree in 1,000 degrees Centigrade. In addition to standard ranges, a large combination of calibrations can be supplied, while Fahrenheit recordings are available.

This ability and readiness to furnish apparatus departing from standard ranges is typical of this firm. It is always a case of

providing the apparatus exactly suitable for a particular application, and not offering a standard product on the " take it or leave it " basis.

We were told that the Ether Ltd. engineers have developed a large number of instruments to cover many practical applications of pyrometry, no matter how simple or complex the individual requirements of industrial concerns may be. The firm's technical staff investigate and advise on the most suitable apparatus and methods to solve problems, and certainly they receive many that require almost the wisdom of a Solomon to resolve.

We learned that while the firm's name is perhaps more famed in the sphere of temperature measuring, recording and controlling apparatus, they produce other essential equipment, such as solenoid-operated valves, motorised control valves, industrial energy regulators, and electrically reset timers.

These last are employed in a large number of applications for accurate process timing, such as the correct time duration for the vulcanisation or curing of automobile tyres and other rubber products, the polymerisation of plastics during moulding and other processes, the optimum soaking time for metals and alloys at their ideal heat treatment temperature. These are only a few of the large number of applications of the Ether "Timer." As an example of efficiency in operation it will, when applied to a moulding press, close the press, time the duration of the cure to a split second, then open the press and warn the operator. All the latter has to do is to load and unload the press. When applied to heat treatment furnaces, it will determine accurately the duration of the soaking time and either warn the operator or turn off the heating at the end of the process.

Electrically timed switches

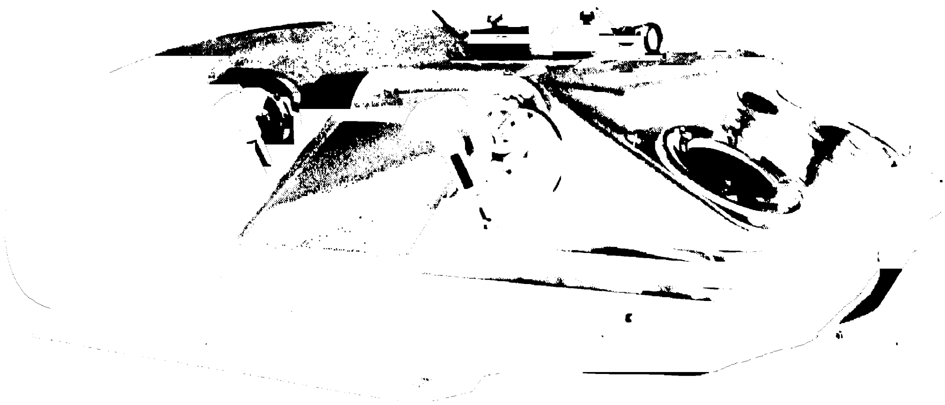
With the present day demand for high quality products and a minimum of rejects, the increasing importance of the time factor in manufacturing processes is becoming widely appreciated by industrialists. It has become essential to substitute precise timing for the old " rule of thumb " approximate timing that has been considered sufficient in the past. Obviously, even the most painstaking and best of operators, when working at maximum efficiency, cannot approach the unerring accuracy of an electrically-timed control switch.

However, like so much of the apparatus designed and produced at these works and laboratories, these timers will do more than the obvious. One or more of them can be employed, integrated and co-ordinated with other controlling instruments, to regulate temperature, pressure, flow and other similar variables, with the operation of electric motor and switches, pneumatic valves, hydraulic gear, dampers, louvres, etc., so that a complete process is maintained under rigidly automatic control. In this way, the operating characteristics and requirements of an industrial processing plant can be made to reproduce those secured with a pilot plant under laboratory supervision.

Motorised control valves

The motorised control valves have been designed specifically to operate in conjunction with a wide range of controlling pyrometers to provide accurate temperature control of ovens, furnaces, baths and other process plants heated by gas, steam and other fluid fuels. Cast in gunmetal, these valves will handle all clean gaseous fuels at normal industrial pressures, while they may also be used for controlling high-pressure water, steam and air supplies. For natural draught furnaces a separate link may be connected to operate the chimney damper to ensure correct atmospheric control by preventing air infiltration. Both fuel and air may be operated from the same motor unit for forced draught furnaces, thus forming complete combustion control although individual valves for fuel and air may be used, if preferred. The motor is energised only during opening and closing of the valve. The valve movement is slow and progressive, thus eliminating surges in the circuit and providing less upset to combustion conditions. Full stroke of the valve takes 30 seconds, while an adjustable stop restricting the movement of the operating crank enables the valve to be opened up to 10 per cent. of its total bore for those installations where it is undesirable to stop the gas flow entirely.

We found the works and laboratories so interesting that it was with surprise and even resentment we found time had flown so speedily. Our conversation with Mr. Stevenson elicited the information that the firm he founded has grown from the original 2 employees to 150, and that there is also a new works at Boreham Wood, Herts., engaged on electronic devices. As to the use of the firm's productions in atomic research security reasons prevent the recording of an interesting story. We left, fully assured that we had seen something of a concern whose products are in the very forefront of progress, constituting a most vital service to industry.



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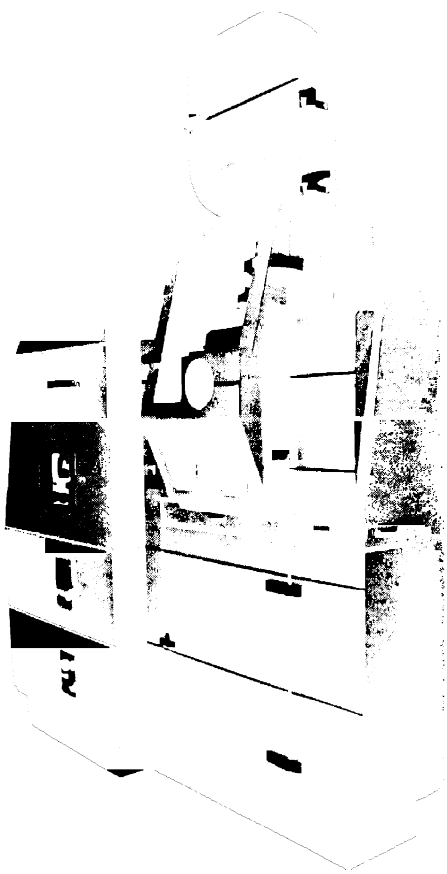


The " Millmaster " shown above is an example of clean, functional body styling in the best modern tradition. The machine is actually a triple roll mill for cosmetics, pastes, powders, etc., and has several unique features unknown in other machines of its class, it was designed by P. S. Balfour and M. A. Haug-Smith for the Boyd Norman Manufacturing Corporation. Below is the latest product from the television industry. It is a television film unit designed for Cinema Television Ltd., by Richard Lonsdale Hands. It is claimed to be the most advanced machine for film televising ever produced and was shown at the B.I.F. this year.

MASS PRODUCED

A NEW tube mill giving eight times the rate of output of old-type plant has been invented in Birmingham, and is already in production. The machine costs about £30,000 and was designed and developed by Major L. B. Henderson of the firm of L. B. Henderson and Partners, consulting engineers. Production and marketing is by Tube Making Machines Ltd. of Birmingham.

The new mill is the fruit of 20 years intense research work in the design, development and production of section and tube mills. Research carried out prior to production proved conclusively that it would be a great asset to evolve a mill which not only would cater for the manufacture of tubes by the electric fusion process, but also, on the same machine, produce a great variety of sections and shapes, together with close-joint and electric conduit tubes. In effect, this means that a firm can produce their requirements of tubing on one side of the machine and sections, such as cycle rims, on the other. Production of tubing from steel strip is claimed at the rate of 100 feet per minute as compared with the 12 feet per minute of the common drawing and annealing method.

On this latest machine stainless steel, chrome-molybdenum steel, Iconel, and other high-duty alloys may be used to form the required close-joint tube or section at the high speeds of which the plant is capable. If necessary, the product may subsequently be seam-welded on a separate ancillary machine by means of the atomic hydrogen, gas or electric arc process. It is desirable to keep the welding process apart from the actual production in order to avoid reducing the speed of the mill to the speed associated with welding processes.

The tubing made by the electric fusion process can be employed in the manufacture of bicycles, furniture, automobiles, buildings, perambulators, vacuum cleaners and similar products. On the other hand, the sections can be used for window frames, windscreens, cycle rims, bus and coach construction, and many other hundreds of different products. Indeed, the variety of both tubes and sections that can be made on these mills is endless, thus ensuring that the plant can be kept in full and continuous production.

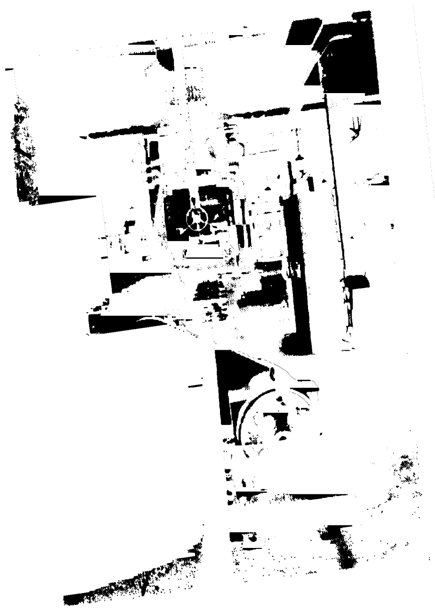
This most modern type of mill—it is called the Henderson Universal Tube and Section Mill—represents the last word in efficiency, simplicity, ease of control and, what is perhaps even more important, low manufacturing costs. It embodies many unique features, while special study has been given to cutting down to a minimum the loss of time in changing the mill from one product to another. An important feature is the economical production of welded tubes in many forms, such as rounds, rectangles, ovals, square and certain special shapes at one pass through the mill without the need of follow-on operations on other machines.

The mills can be equipped with ancillary mechanical devices for shearing the edges of the strip to exact width or for embossing, notching or piercing as the strip passes through the machine. The forming rolls are of special design, interlocked for alignment of strips and quick setting up. The accurate cutting off to any given length of the finished tube or section is done at mill speed, the finished stock automatically falling into trucks for removal to stores.

Besides producing low carbon steel tubes, these mills will also produce certain stainless steel and alloy tubes, while in the section production, carbon steel, stainless steel, brass, aluminium and its alloys can all be used for high speed production. A novel and patented feature is the central worm drive and double ended roll spindles, which enable the mill to be set up for forming on both sides, one side for electric welded tubes and the other for sections or close joint tubes. Each stand comprising a pair of roll spindles can be quickly removed if not required, without affecting the drive of the others. As one coil is being used a new coil is loaded on the other side, and is swung into position by rotating the stand when required, thus preventing the mill being idle during loading.

continued on page 89

TUBE



Outlining a practical system that may be applied to almost any plant

THE problem of applying incentive bonus schemes to maintenance work is probably the most difficult to be encountered in the entire field of industrial practice owing to the fact that the amount of work and its particular nature cannot always be foreseen, and again, the methods of the individual workers, their diligence, and their personal initiative and skill, vary from job to job.

Indeed it might be argued that the payment of incentive bonus to such workers is objectionable on ethical grounds as constituting a bribe to the workman to fulfil his contract of employment, assuming he is paid an adequate wage.

However, this is a hypothetical objection, frequently encountered before the inception of any bonus scheme but rarely borne out in practice. Too many bonus schemes fail, not because our conception of incentives is wrong, but because those who have operated the majority of such schemes have not always worked out the basic principles which alone can make them successful in operation.

The system considered here is based on two fundamental principles :—

Firstly, that the prevention of breakdown should be both the inspiration and object of a maintenance team and, secondly, that this object should be achieved by the minimum of service at the longest possible intervals.

A practical system of Maintenance Control is, therefore, the prerequisite in any incentive bonus scheme and, while it would be useless to lay down any rigid procedure, certain functions must exist as part of efficient management—let alone payment of economic incentives.

The prime factor, therefore, of Maintenance Control is the creation of a Schedule of Work which will define the following functions

(1) What work has to be done.
(2) How the work shall be done.
(3) The time required to do the work.
(4) The personnel required to do the work.

It will be apparent that such planning will reduce the mental labour of servicing to a minimum and enable the available labour to be allotted specific tasks of known work value in terms of the man hours required.

However, even when maintenance requirements have been scheduled, this is only the first step. The real problem lies in getting the work done in accordance with the requirements of the schedule.

There is nothing particularly difficult in devising the schedule of work for it is probable that much of the basic information is already to hand, such as a complete list of plant, descriptions and so forth. It is only necessary to add to this information by writing out a detailed list of the servicing operations to be carried out by the Fitters and deciding when such service should be performed.

A further—and essential—refinement is to add the times required for the performance of each maintenance job. Such times can be determined, either by Time Study of the work, or else from an assessment made by a suitably qualified engineer. The choice will have to be decided in accordance with whatever facilities are available on the factory and the amount of plant to be covered. In either event, due allowance has to be made for contingencies encountered during the course of routine inspection but no undue difficulty should be encountered in this direction as, in general, maintenance work falls under two main headings, Routine—or Scheduled—Maintenance, and Repair Work.

At this stage Scheduled Maintenance only is considered, Repair Work being dealt with later.

The inherent nature of Scheduled Maintenance is such that it can only be carried out when machinery is stopped, either at shift break, or at the week end. The sum of each of these two periods is, therefore, the governing factor in the time available for the performance of this class of work.

At the same time, a further factor has to be taken into account. The total time required to do the various jobs.

Both these sources of information require to be correlated in one record which should be the media, not only for deployment of personnel doing specific jobs, but also, as a control record for checking that the work has been done in accordance with the schedule.

The most useful way of accomplishing this object it by use of a Graphdex Chart of the type shown in Fig. I. This provides a "visible" forecast of all work required to be performed over a given period, the method of presentation being sufficiently flexible to allow for adjustments to the Maintenance Programme to meet varying conditions such as change in production programme, and movement of personnel within the maintenance team itself.

The time scale is read along the top edge of the panel in the body of which coloured symbols indicate the due date for each type of service together with its periodicity, monthly quarterly, and so on, such frequencies being, indicated by the different colours used.

Each symbol also carries the time allotted for the particular service so that vertical addition provides the "load" in terms of man hours for shift, weekly, and period overhauls, as indicated by their respective colours on the chart.

It will be appreciated from the foregoing that it is now possible to determine the actual number of workers required in accordance with the following formula.

$$\frac{\text{Amount of work to be done}}{\text{Time available}} = \text{No. of personnel required}$$

Assuming that shift service can only be carried out when production ceases, at change of shift—30 minutes, and weekly and longer period services on Saturday, 8 hours, and that maintenance and process workers work a 3-shift system totalling approximately 40 hours/week; then it is possible to determine the actual number of workers required as the following example will show.

Example.

Shift Service.

Total time required for shift service = 75 Hrs./week.

Time available at 3 Shift breaks ($\frac{1}{2} \times 3$) 5 = $7\frac{1}{2}$ Hrs./week.

$\therefore$ Number of personnel required $= \dfrac{75}{7\frac{1}{2}} = 10$ workers.

Weekly and Periodic Overhauls.

Total time required for Period services = 102 Hrs./week.

Time available (Saturdays) = $8\frac{1}{2}$ Hrs./week.

$\therefore$ Number of personnel required $= \dfrac{102}{8\frac{1}{2}} = 12$ workers

As might be expected, periodic services require the larger number of fitters and is the "key" operation to maintenance work as a whole. In these circumstances, it is possible to build up a team as follows.

Hours worked per week per fitter = 40 hours

Team required — 12 Fitters.

Total Hours worked by the team

$= 40 \times 12 = 480$ Hours per week.

Hours required for Shift services = 75 Hours week.

Hours required for Periodic services = 102 Hours/week.

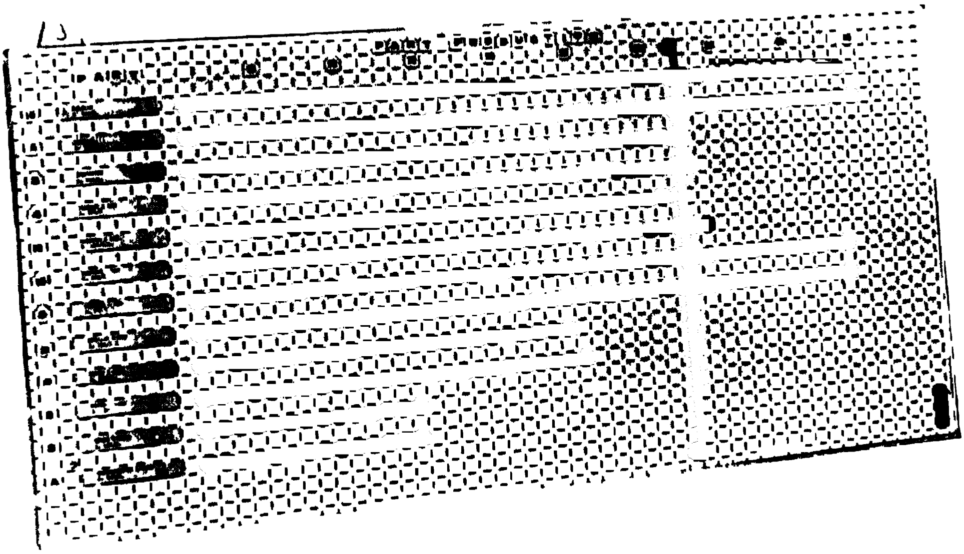
Total Hours required for Scheduled Maintenance = 177 Hrs./week.

$\therefore$ Hours remaining for repairs = 480 — 177 = 303.

The majority of factories already have some system or other of recording the time spent by the maintenance services. Usually a Time Sheet is employed for this purpose and analysis of such sheets will serve to show whether the hours remaining for Repair Work—made in accordance with the above calculation—are sufficient, always assuming that the fitters are working at a reasonable rate of effort.

The salient point is that the Time spent should be split under the main headings of "Scheduled Maintenance" and "Repair Work" for the amount of the latter is some reflection of the quality of the former.

So far we have considered Maintenance requirements only at the planning stage but, as stated earlier, it is essential that the plan should become effective in operation and that routine arrangements should suffice to cause the appropriate service to be done in the correct manner and at the right time. By scheduling maintenance requirements, the nature of the service becomes recurrent, and it is a comparatively simple matter therefore



to pre-write (or print) on a Daily Time Sheet the work which has to be carried out on any item of plant during any particular time of day. When pre-writing the time sheet, individual times for a selected number of jobs are grouped together to constitute an approximate day's work. It should be understood that the term " a day's work," implies work which can only be done, either during shift break, or at the week end.

Scheduled Maintenance, however, is only part of the work which can be done during the day so, after completing the jobs detailed on the Daily Time Sheet, the fitter is available to carry out such Repair Work as may be allocated to him at the foreman's discretion, such work being written on the Daily Time Sheet in the foreman's office.

It is opportune to note that fitters usually dislike " paper " work in proportion to their degree of skill, and an advantage of the system outlined in the foregoing lies in the fact that the only clerical entry required of the fitter is the *total* time taken to do the job—not his starting and finishing times.

In fact, the method proposed has psychological as well as practical advantages for it alters practice into procedure. It is a fundamental principle that records intended for management control must be comparative and not merely historical. It follows that any records or statistics prepared to show the efficiency of a particular plant must be capable of comparison with standard figures for that plant, and, likewise, figures for individual items of plant must also be capable of comparison. The establishment of standard practice, both in procedure and work measurement, are therefore essential.

Having pre-written the Daily Time Sheets in accordance with the Schedule of Work, these should be issued to the fitters by the Maintenance foreman. At the end of the day, or shift, they are collected and become the media for both checking that the individual jobs have been carried out and, also, for computing how long those jobs have taken in comparison with the allotted times.

While fluctuations are bound to occur as between individual jobs, owing to the varying state of the plant, the total of time spent on any particular class of work should be capable of comparison on a statistical basis and the interpretation of such information is part of the management function. If the times booked on the Daily Time Sheets are inflated, then non-productive time may have been booked as productive, or contingencies may have arisen for which no allowance has been made. If times are less than those allotted, then the work may have been skimped or else carried out in a different manner to that prescribed in the Schedule. These are just a few examples of what may be reasonably expected to occur.

Incentive Bonus.

It is always understood in any form of incentive bonus scheme that payment is con-

ditional upon the work being done and the quality of such work being satisfactory.

When the work has been scheduled, and the necessary controls are in operation, it is a comparatively simple matter to ensure that work is at least carried out, for the Daily Time Sheet becomes the all important record and is the primary bonus earning document.

The main difficulty encountered in industry so far has been to determine a sound basis by which bonus payment may constitute an incentive to keep plant in good fettle at all times.

If we use the hypothesis that the *quality* of maintenance work is reflected in the *quantity* of repair work, the efficiency of the maintenance services will be evidenced by the *availability of the plant for production* and can be expressed as a "plant availability factor," this factor being determined as follows:—

$$\frac{\textit{Potential Productive Hours} - \textit{Hours lost due to breakdown}}{\textit{Potential Production Hours}} \times 100$$

It should be noted that the hours lost due to mechanical breakdown are "productive" hours and not "machine" hours. Thus, if a machine on which, say, four operators depend breaks down and is out of commission one hour, the time lost to *production* is four hours. The purpose of using productive hours is to throw into correct perspective the absolute necessity of servicing plant upon which a number of operatives are dependent, thus emphasising the function of efficient maintenance as an aid to production.

The application of the Plant Availability Factor is, therefore, a method of control of maintenance work where time is lost through stoppages of machines or plants. During the stoppages it is a maintenance function to repair the plant so that production can be resumed and it is logical to offer an inducement to workers to minimise this period of time lost.

In view of this, it is considered that the Plant Availability Factor provides a basis which is both fair and easily understood by all concerned.

If a basic availability is set, then it is possible to pay a bonus for increases in efficiency between basic and 100%. This basic availability factor is found by examination of productive time lost due to breakdowns over a given period—say six months—and the curve shown in Fig. 2 shows the bonus factors which can be earned for improved availabilities through a range of 3%. Although a straight line method of calculating bonus from basic to 100% would be the simpler operation, it is considered that this is neither equitable nor does it offer sufficient incentive to the maintenance staff to achieve the maximum efficiency, thus; the greatest incentive should occur when the goal of 100% availability is nearest achievement and examination of the curve shown will illustrate this point.

The formula used to construct the curve in line with the foregoing policy is as follows:

$$\frac{30\,Y}{2\,(100-X)-Y}$$

Where 30 is a constant determined by the maximum bonus to be paid for 100% plant availability

Y = The difference between basic availability and the actual availability obtained.

X = The basic availability for the plant

Example.

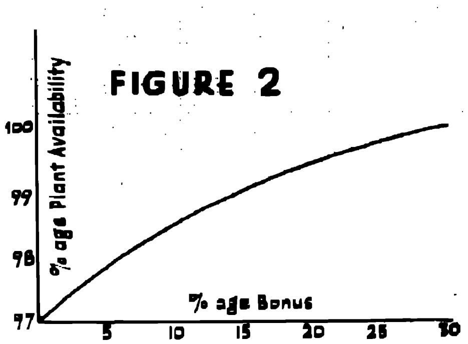
Actual plant availability = 99%

Basic plant availability = 97%

Therefore X = 97% and Y = 99% − 97% = 2%

Equation $$\frac{30\,(2)}{2\,(100-97)-2} = \frac{60}{4} = 15\%$$

The above calculation is based on the



Formula $$\frac{30\,Y}{2\,(100-X)} - Y$$

30 = Maximum Bonus for 100% Availability

Y = Difference between Basic and Actual Availability

X = Basic Plant Availability

Please turn to page 86

AMERICAN DIGEST

Bringing news of the latest developments from the U.S.A.

[illegible] Duplicating. This system of producing metal parts to close tolerances is based on the use of a series of small, hand-operated forming machines, shears, brakes, benders, etc. Each machine is the result of specialised development over a long period and the following are typical examples of work which can be done entirely by hand. Chain making, clips, fasteners, tube bending, forming of channel and similar sections, T's, V's etc., from sheet; transformer laminations, tabbed metal parts, small boxes, covers, guards etc.

[illegible] A new type of bit for small rock drills has been produced by the Carboloy Co. and has an amazing length of life compared with an ordinary steel bit. The new tools have inserts of tungsten carbide and show no more wear after drilling 250 feet of granite than steel bits do after 2-3 feet. The new bits will drill at the rate of 25-30 feet a minute compared with steel at 12-14 feet a minute.

The diameter of the Carboloy product remains constant thuse liminating tapered holes.

[illegible] Seaming Machine. The Union Special Machine Co. of the U.S.A. has now added an electronic seaming machine to its range of industrial sewing machines.

The new machine will seal all films in the vinyl group of plastics at rates of 18-25 ft./min. Maximum thickness of film 0.04 in., maximum seam width 0.25 in.

The power oscillators are built by the Radio Corporation of America and automatic tuning means are provided to cover variations of material thickness.

The price of the equipment is £490 f.o.b. Chicago.

Powder Lubricant. Powdered graphite has been known as a lubricant for over a century but "Grafize," the product of the Schmidgall Co. is not a graphite compound, though it contains a little graphite. It is a light grey, non-abrasive powder intended, not to replace oil or grease but to be used where these would spatter or drip, collect dust, freeze or cause soiling of materials.

It is applied with a simple powder blower or it can be added to existing oils and greases so that less of them will be required.

Curved Tooth File. A curved tooth file made by Heller Bros. of Newark, U.S.A. is being sold under the name of "Vixen Wizcut." The tool is claimed to be self-clearing or non-clogging, by reason of the chip-breaking grooves superimposed on the curved contour of the milled teeth. The file cuts with a shearing action irrespective of whether it is used straight or at an angle.

Electrically Conductive [illegible] Coatings. The application of an electrically conductive organic coating in the most convenient method of making plastics (or other non-conductors) conduct electricity.

Although comparatively expensive compared with other metals, the silver coatings developed by Metaplast and the duPont companies in the U.S.A. are considered to be worth the extra cost.

The coatings consist of a lacquer, varnish or other medium, containing silver and a range of mixtures is made to cover all industrial processes. If desired, the coating may be electroplated.

Prices (in the U.S.A.) vary between 5/- and 8/- per troy ounce.

Electrical Impact Tool A new portable all-purpose electric tool with an impact mechanism has been announced by the Ingersoll-Rand Co. of the U.S.A.

Using various attachments it can be used for drilling, reaming, tapping, screwdriving, applying and removing nuts, etc.

The tool, which weighs only 6½ lb., runs as an ordinary electric tool until resistance to rotation is reached, when a mechanism converts the torque of the motor into powerful rotary impacts. There is no twist or kick when the machine is operated and it is impossible to damage the motor by stalling.

Tube-Shearing Tool. A tool developed by the Vogel Tool and Die Corp, is designed for preparing the ends of tubes to be welded in angles or T's.

It will shear tubing from ½ in. to 2 in. outside diameter and welds or brazes may be made without further preparation of the material.

This "Arc-Fit" tool weighs only 90 lb.

Books

FURNITURE FROM MACHINES, by Gordon Logie. *George Allen & Unwin, Ltd.* 21/-, 150 pp.

The use of machinery in the manufacture of good quality furniture is a development faced with unusual difficulties. Whereas in most industries the adaption of machine methods is applauded as an indication of efficiency and progressiveness, the producers of machine made furniture, and indeed all furniture utilising new processes and materials, are faced with an accumulation of prejudice. This prejudice springs from the too prevalent exploitation in the past of the machine's ability to produce cheap furniture, with little regard for quality.

This book reveals that by matching design to the materials and methods at hand, cheap and in many respects superior furniture can be turned out. Once more we see established the principle emphasised by industrial designers—that design must mould itself to the new materials at its disposal, that twentieth century methods and possibilities must not be curtailed by habits of the past.

Mr. Logie introduces his subject with an analysis of furniture as it should be. There follows a discussion of the influence the use of plywood and synthetic resin cements have had, and can have, on furniture construction. Modern woodworking machinery and its use is described. This section is particularly inclusive and may be regarded as an excellent guide to equipment available to the cabinet shop. Plywood, bentwood, steel tubing, light alloys, and plastics share a prominent place in machine made furniture, and as such each receives special treatment.

In addition to its obvious value to those engaged in the manufacture of furniture, this work will be of considerable interest to industrial designers. The book is a resume of a present day trend apparent in a particular industry, and as such is a source to which the designer will logically turn. It is profusely illustrated, and is enhanced by an instructive introduction by the eminent designer Mr. John Gloag.

TIME STUDY AND COMMON SENSE. By A. Cohen. Published by *Macdonald & Evans*. 10/- net. 112 pp.

As late Head of the Organisation Department, Lever Bros and Unilever N.V. Rotterdam; and, during the war, Management Consultant to the Ministry of Supply, the Author can justly claim our attention as being one of the leading authorities on his subject. As the title of the book suggests, the angle of approach is original and, though no new theories are advanced, it does explain in simple terms the mysteries which all too often have tended to surround time and motion study.

The book should prove of considerable help to all those engaged on work measurement as it proves that time study is not just a combination of the stop watch and slide rule, but must stand or fall on the inherent sense of judgement on the part of the observer. The human element, therefore, plays a large part in such methods of assessing work values and the basis of these methods must be clearly defined if they are not to become suspect by Management and Trade Unions alike.

The publication of such a book at the present time is opportune in view of the widespread interests in economic incentives as the key to industrial recovery. The Author however does not make the mistake made by so many of his contemporaries of confusing time study with rate fixing. The primary purpose of time study is work measurement in terms of the human effort involved in the performance of a given task. Such " standard " times are the only sound basis of cost and production control and it is natural that they should be used in the formulation of the incentive bonus schemes.

Mr. Cohen has much to say about the problem of industrial fatigue which is both original and interesting, and his book goes a long way towards completing a bridge between theory and practice.

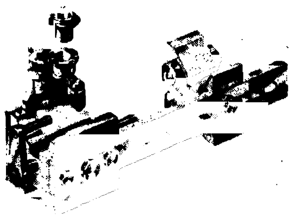
INDUSTRIAL APPLICATIONS OF INFRA-RED, by James Doyle Hall. *McGraw-Hill Book Co. Inc.*, 21/-, 201 pp.

In writing this book, Mr. Hall has made a valuable contribution to that field of technical literature dealing with processes of manufacture and fabrication the value of which have only recently been fully recognised. In this category may be listed the use of infra-red radiation for the wide variety of purposes described by the author.

Although much advanced technical detail could be introduced in connection with this subject, the author has made an excellent compromise between scientific completeness and appeal to the untrained but interested reader. The introduction provides a brief description of the nature of infra-red energy. The advantages of heat from this source are summarised, and the writer then goes on to describe the equipment, its installation and use.

Review of EQUIPMENT

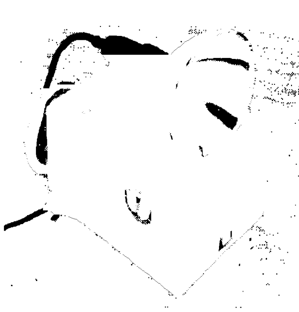
Radial Hole Drilling Jig



The jig shown above is a useful tool for the purpose of drilling radial holes in shafts, pinions, collars, etc. A special descriptive leaflet is available from the supplier. This will be sent to any reader on request.

Supplier :—**Brooks and Walker Ltd.,** 41 Dockhead, London, S.E.1.

High Intensity Stroboscope



A high intensity type Stroboscope employing a separate hand lamp and arranged in a portable carrying case. It is intended for applications requiring a greater light output than the Stroboflash but where the high intensity of the Stroboflood is not warranted.

Range is from 250 to 6,000 flashes per minute and up to 30,000 r.p.m. by using multiples of the flash speed.

Supplier :—**Dawe Instruments Ltd.,** Harlequin Avenue, Brentford, Middlesex

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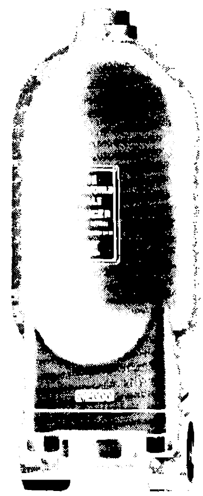
Scale Reducers



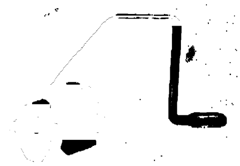
The New World Industrial Scale Reducer has been produced by Radiation Ltd., to prevent hard scale formation in hot water systems.

The device carries a charge of Micromet which, by dissolving in minute quantities into the cold feed water, minimises scale formation from hard water heated to 170°F., and at higher temperatures tends to produce a softer deposit rather than the hard scale thrown down from untreated water.

The device is capable of treating 2,000 gallons of cold water daily for scale reduction and operates without attention beyond monthly "topping up" with Micromet.

Supplier :—**Radiation Ltd.,** 7 and 8, Stratford Place, London, W.1.

Universal Drum Opening Tool



To prevent loss of valuable material, the makers of this unique tool have provided, on one universal handle, a full set of the necessary keys to enable any bung to be unscrewed or tightened up. Being made in one compact unit there is nothing to get lost or mislaid and the right tool for the job is always available.

Supplier :—**Victor Blagden and Co., Ltd.,** The Manor, Davis Street, London, W.1.

Steel-sleeved Carbon Bearings

A new product shown at the B.I.F. was this range of steel-sleeved carbon bearings requiring only a press fit instead of the usual shrunk-on fit normally required for heat applications.

Supplier :—**Morgan Crucible Co., Ltd.,** London, S.W.1.

Review of EQUIPMENT

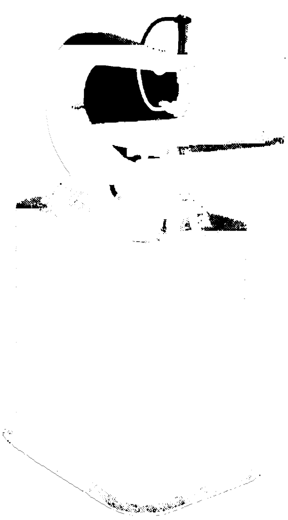
Paint Dipping Machines

The machine illustrated above is a new version of a familiar type of machine. Designed for dipping all types of painted products, it is provided with a counter-balance system and a method of control, by means of valve settings, to enable almost any type of object to be handled regardless of the time required for immersion or the type of paint used. It can be supplied for wall or stand fitting and the size and capacity of the tank can be varied to suit individual requirements.

Suppliers :—**Bullock Parsons and Co., Ltd.,** Golden Valley Works, Brimscombe, Glos.

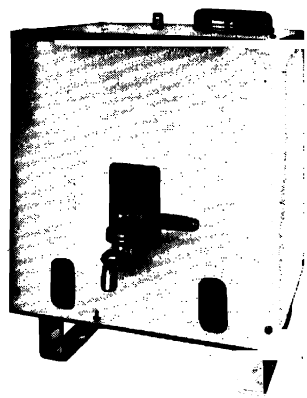
Scroll and Jigsawing Machinery

The " Pacera " Wood and Metal Workers Scroll and Jigsaw has been designed by the manufacturers of the " Pacera " range of Machine Tools to cut timber to a thickness of 2¾ in. Also sawing and filing operations are easily and quickly executed on steel and non-ferrous sheet plastics, asbestos, and resin impregnated materials to within the capacity of the machine.



Supplier :—**W. J. Meddings Ltd.,** Kingsley Works, Ipswich Road, Slough.

Water Boiling Apparatus



Made by Radiation Ltd., this New World model gives a most flexible boiling water service. Compared with other appliances supplying boiling water in bulk, it shows a remarkable fuel economy, and with the low gas consumption of 40 cu. ft. per hour (20,000 B.Th.U./hr.) presents no gas supply difficulties.

The new boiler is of modern design in white vitreous enamelled casing, polished vent cap, chromium plated draw-off tap with insulated handle and plated supports, making it simple and easy to clean.

Supplier :—**Radiation Ltd.,** 7 and 8, Stratford Place, London, W.1.

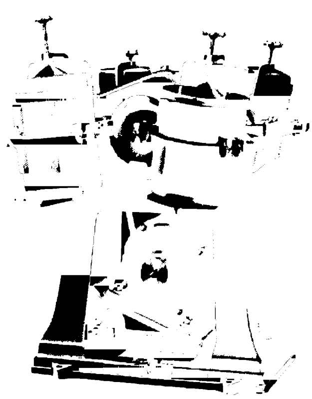
Wet Sandstone Grinders

This is an excellent machine for sharpening all types of Woodworking Edge Tools and besides being a very useful auxiliary machine in larger works is ideal equipment for training schools, leatherworkers, farmers, butchers, gardeners, etc.

It is well designed, and the body casting is provided with drain plug and adjustable angle toolrest. Provision is also made for taking up stretch in belt.

Supplier :—**W. J. Meddings Ltd.,** Kingsley Works, Ipswich Road, Slough.

Can Shaking Machinery



These machines have been designed for re-mixing paint after storage in containers and claim, by violent mechanical agitation, to effectively re-mix in a few minutes the most densely packed pigment.

The machine is made in a variety of sizes of such range that the large manufacturer can re-mix sixty gallons of paint in five gallon drums as quickly as the user can mix one quart tin.

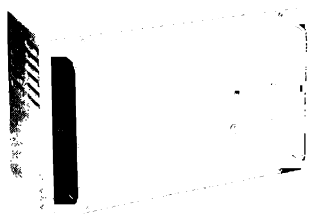
Supplier :—**Steele and Cowlishaw Ltd.,** Cooper Street, Hanley, Stoke-on-Trent.

Parts Degreasing Apparatus

Made in three standard models, the Dawson hydro, shown here, will degrease, wash and clean all types of metal parts, fittings and equipment. Small parts such as nuts, bolts, screws or washers are fed into the machine in wire mesh baskets while larger parts such as motor car engines are placed on the moving rack as shown in our illustration. The machine gives a pumped solution wash under pressure at 180°F. and, after double filtration the solution is pumped through a D.B.L. high efficiency centrifugal pump to the jet pipes under the canopy. These jets are so arranged that the risk of clogging is reduced to the very minimum. A counterbalance is provided to give ease of operation for the door.

Supplier :—**Drummond-Asquith Sales Ltd.,** King Edward House, New Street, Birmingham.

Electronic Counters

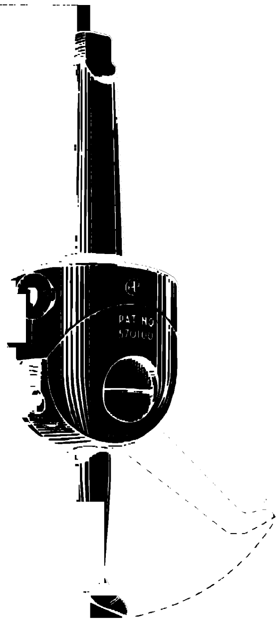


This instrument provides a method of counting electronically at ultra high speed with absolute accuracy, and is suitable also for timing. The main features of this inherently static instrument are: Direct Reading; Extreme Accuracy; Silent Operation; Reliability.

Supplier :—**Airmec Laboratories Ltd.,** 19 Charterhouse Street, London, E.C.1.

Review of EQUIPMENT

Boring Tools



Here is a tool that departs om the orthodox and strikes ı entirely new note. *It fsets radially.* This method ossesses several distinct ad-ıntages when a comparison made with similar tools nploying the more familiar iding offset.

The body of the A.B.C. oring Head is dome shaped ıd devoid of protrusions hich might endanger the perator. Adjustment of off-t is obtained by means of an llen key provided, whilst e same key is also used for cking the Head for con-ıuous runs of constant ameter boring.

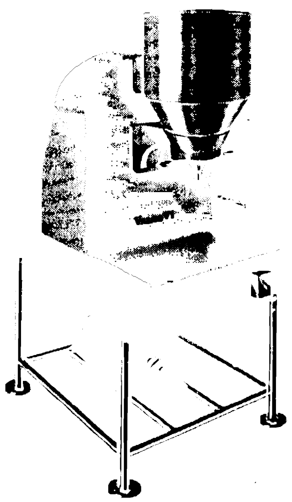
The tool may be fed in eps of .001 inch but it is uite capable of taking cuts p to .060 inch. Two boring ols of ⅜ and ½ inch are ıpplied, together with an laptor sleeve for the smaller tool. Shanks are normally No. 2 or 3 Morse taper tanged or tapped for draw bar, but any other type of shank will be supplied at no extra charge.

Supplier : **Pearson Phillips Ltd.,** 194, Finchley Road, London, N.W.3.

Automatic Spiral Filling Machines

This machine is an entirely new and modernised version of the well known and accepted method of spiral filling. It is automatic in action—once it has been started it delivers a pre-determined quantity of powder, etc., every 2 seconds and all the operator has to do is to do is to feed the containers to the nozzle of the machine.

The material is untouched by hand thus guaranteeing



hygienic packing. A Counter can be fitted which records the number of fillings per day and also the total per week. The pulley situated behind the machine is arranged to take the drive from a geared motor as shown on illustration or from an existing countershaft. Table can be fitted with Castors if desired. The speed of fillings is decided by the adroitness of the operator. A beginner can keep up with 30 per minute but after experience it is possible to speed up to 50 per minute by increasing speed of drive.

Supplier :—**Valley Products (Lye), Ltd.,** Valley Road, Lye, Stourbridge.

Rotary Type Filling Machine

This rotary type machine measures quickly and accurately pre-determined quantities of material at a constant speed of delivery from 20 to 30 fillings per minute to suit purchaser. Operator simply places container under the discharge chute in time with the machine. Single fillings can be taken when required.

Supplier :—**Valley Products (Lye) Ltd.,** Valley Road, Lye, Stourbridge.

Forthcoming M.O.S. AUCTION SALES

Date.	*Site of Sale.*	*Auctioneer.*
	Radio, Photo and Electrical Stores.	
June 15th to June 25th.	M.O.S. Depot 121, Ashchurch, Glos.	Bruton Knowles & Co., King Street, Glos. Tel.: Glos. 2267; and Geo. Hone, 120, High Street, Tewkesbury. Tel.: Tewkesbury 10.
June 16th.	R.A.F. M.U. No. 16, Sandon Road, Stafford.	South & Stubbs, Bank Passage, Stafford. Tel.: Stafford 82.
June 17th.	R.A.F. M.U. No. 61 Sub-site, Cranage, Nr. Middlewich, Cheshire.	Brady & Son, 17, Warren Street, Stockport Tel.: Stockport 2252/3.
June 22nd.	R.A.F. M.U. No. 25, Hartlebury, Kidderminster, Worcs.	Nock & Joseland, Bank Buildings, Kidderminster Tel.: Kidderminster 2053.
June 23rd.	Admiralty Storage Depot, Risley, Nr. Warrington, Lancs.	Outhwaite & Litherland, 3 Eberle Street, Liverpool, 2. Tel.: Liverpool CEN. 6561.
June 24th to June 25th.	M.O.S. Depot, Newbury Racecourse, and M.O.S. Depot, Thatcham, Nr. Newbury.	Dreweatt, Watson & Barton, Market Place, Newbury. Tel.: Newbury 1.
June 25th to June 27th.	R.A.F. M.U. No. 259 Sub site, Woolfox Lodge, Greetham, Rutland.	D. N. & J. Royce, Market Street, Oakham, Rutland. Tel.: Oakham 20.
June 30th to July 1st.	R.A.F. M.U. No. 3 Sub-site, Kingston Bagpuize, Berks.	Adkin, Belcher & Bowen, 10, High Street, Abingdon, Berks. Tel.: Abingdon 25.
	Miscellaneous R.A.F. Stores.	
June 2nd to June 3rd.	R.A.F. M.U. No. 268 Sub-site, Riccall, Yorks.	J. S. Nettleton & Sons, 6, Hall Gate, Doncaster. Tel.: Doncaster 3636.
June 7th to June 11th.	R.A.F. M.U. No. 265, Grove, Wantage, Berks.	Adkin, Belcher & Bowen, Market Place, Wantage. Tel.: Wantage 48; and Hobbs & Chambers, Faringdon, Berks. Tel.: Faringdon 2113.
June 14th to June 17th.	R.A.F. M.U. No. 255 Sub-site, Balderton, Nr. Newark, Notts.	Escritt & Barrell, Elmer House, Grantham Lincs. Tel.: Grantham 1035/6.
June 21st to June 24th.	R.A.F. M.U. No. 262, Eccles, Nr. Attleborough, Norwich.	T. W. Gaze & Son, Crown Street, Diss, Norfolk. Tel.: Diss 13.
June 28th to June 30th.	R.A.F. M.U. No. 3 Sub-site, Wombleton, Yorks.	Cranswick & Cranswick, 94, Quay Road, Bridlington. Tel.: Bridlington 2110.
	Machine Tools, Testing Equipment, Sea Transport, etc.	
June 1st to June 3rd.	M.O.S. Depot 154, Castlecourt, Westgate Street, Cardiff.	Stephenson & Alexander, 5, High Street, Cardiff Tel.: Cardiff 3249/50.
June 8th.	M.O.S. Depot, Madingley Road, Cambridge.	Wheatley, Kirk, Price & Co., 2, South Audley Street, W.1. Tel.: Regent 7150.
June 16th to June 17th.	M.O.S. Depot 47, Bristol Tramways, Bristol.	Edward T. Parker & Co., St. Stephens Street, Bristol. Tel.: Bristol 22581/2.
June 30th to July 1st.	M.O.S. Depot, Calgarth, Windermere.	G. F. Singleton & Co., Lloyds Bank Buildings, 53, King Street, Manchester, 2. Tel.: Blackfriars 2264/5.
	Vehicles, Cycles, etc.	
June 1st to June 4th.	M.O.S. Depot, Mount Farm, Dorchester, Oxon.	Simmons & Sons, 12, Station Road, Reading. Tel.: Reading 4025/26.
June 14th to June 29th.	M.O.S. Depot, Byram Park, Brotherton, Yorks.	Hollis & Webb, 3, Park Place, Leeds, 1. Tel.: Leeds 29671/2.
June 22nd to June 24th.	M.O.S. Depot, Elstow, Kempston Hardwick, Bedford.	W. & H. Peacock, 10, Lime Street, Bedford. Tel.: Bedford 3115.
	Miscellaneous Stores.	
June 8th to June 10th.	M.O.S. Depot 65, Wivenhoe, Essex.	F. S. Daniell & Son, Headgate, Colchester. Tel.: Colchester 3336.
June 8th to June 11th.	M.O.S. Depot 46, Cornholme Mills, Todmorden, Yorks.	Salisbury & Hamer, 50, Ainsworth Street, Blackburn. Tel.: Blackburn 5051.
June 15th to June 17th.	M.O.S. Depot 1, Royal Arsenal, Woolwich, S.E. 18.	Wheatley, Kirk Price & Co., 2, South Audley Street, W.1. Tel.: Regent 7150.
June 23rd to June 25th.	M.O.S. Depot 89, Aber Tinplate Works, Llansamlett, Glam.	J. Oliver Watkins, 28, Walter Road, Swansea. Tel.: Swansea 4121.
June 23rd to June 25th.	No. 65 O.S.D. (Don), Lockerly, Nr. Southampton.	Fuller, Horsey, Son & Cassell, 10, Billiter Square, London, E.C. Tel.: Royal 4861.
June 23rd to June 25th.	M.O.S. Depot 158, Stratford Airfield, Atherston-on-Stour.	Perry & Deskin, 32, Paradise Street, Birmingham. Tel.: Birmingham MID. 1810.
June 23rd to June 25th.	M.O.S. Depot 9, Ashwell & Morden, Nr. Baldock, Herts.	Nash, Son & Rowley, High Street, Royston, Herts. Tel.: Royston 2112.

Although it is anticipated that these sales will take place on the dates shewn, they should be taken as *tentative* but the change of dates, if any, will only be a few days.

Lists of the type of stores to be included in the sales are not yet available, in the majority of cases they will be of a miscellaneous character: Electrical, Mechanical Plant and Equipment and textiles, at each sale.

By Our Market Correspondent.

The Commodity Markets

Indication of Upward Price Tendency.

THE combination of E.R.P., war psychosis and stockpiling in U.S. are making a fall in commodity prices more remote than appeared likely at the start of the year.

How far the Marshall Plan will actually affect values, remains to be seen but American Administrators contend that it should not cause any marking up. It has become evident in the States that the Recovery programme will enable European countries to avoid sharp cuts in purchases of raw materials ; hence a price slump from this angle is not likely. It is obvious from home index figures that, unless the current month shows a definite drop, the commodity price curve for the first half of the current year will indicate an upward tendency.

In any analysis, it is essential to divide all commodities into two main groups—foods and industrial raw materials. Historically, the two move together and while there has been divergence recently, there is no reason to suppose that ultimately they will not move in unison.

Price standstill Orders introduced as part of the Official anti-inflation policy, have not actually proved to be *reductio ad absurdum*, but the Government is now in the bizarre position in which it depends upon the good will of industry.

Metals and the Exchange.

The matter of re-opening the London Metal Exchange has again come to the forefront and the plans put forward by the Committee of the Exchange involve dealings in all four metals—tin, copper, lead and zinc. Quantities of the three latter, also aluminium, are to be received under the Marshall Plan.

It has been made clear that the Government has no objection in principle to the re-opening of the Metal Market provided the risk of losing dollars through adjusting operations with New York is avoided. The existence of a Metal Market of International scope in London gives greater prestige to sterling and increases its use in International trade.

Copper, lead, zinc and chrome ore continue to be bought by the Ministry of Supply under varying arrangements from a large number of producing companies all over the world and prices paid are the result of normal commercial bargaining. Aluminium, is bought under contract from producers in the U.K. and Canada. Prices paid are treated as confidential, and it is not known precisely what profit the Government makes in selling to consuming interests. In the case of Tin, this is bought at a figure fixed after discussion with producers' representatives, who all get the same basic payment, which is made public.

Copper and Tin.

Domestic quotation for COPPER (electrolytic and wire bars £132 p. ton) remains steady. Unlike Lead and Zinc, it is below its post-war peak and there seems to be no reason why it should not further fall in price. The fluctuation in New York agency price does not actually represent dealings in physical metal.

There has been no change in TIN, resulting from the review of the position by the Tin Study Group in Washington. Bolivia has pressed for a higher price or for the return of a free market trading in the metal. The opinion is expressed by Metal Market men that the fact of the metal being subject to the International allocation scheme under which supplies are shared out between world consumers, would not prevent Exchange dealings.

Apart from U.S. stockpiling needs, there is prospect of supply and demand reaching equilibrium. Some countries, particularly hard currency countries, are not taking their full allocations.

Mined tin production throughout the world this year is put at 150,000 long tons, gradually increasing with the rehabilitation of the Far Eastern mines (Malaya) to 200,000 tons in 1950. Fixed price £519 p. ton.

Dominant Factors in Lead and zinc.

The U.S. quotation for LEAD and ZINC have, this year, risen to their highest since the war. So keen are American consumers that some are paying a premium over the official price in the international market.

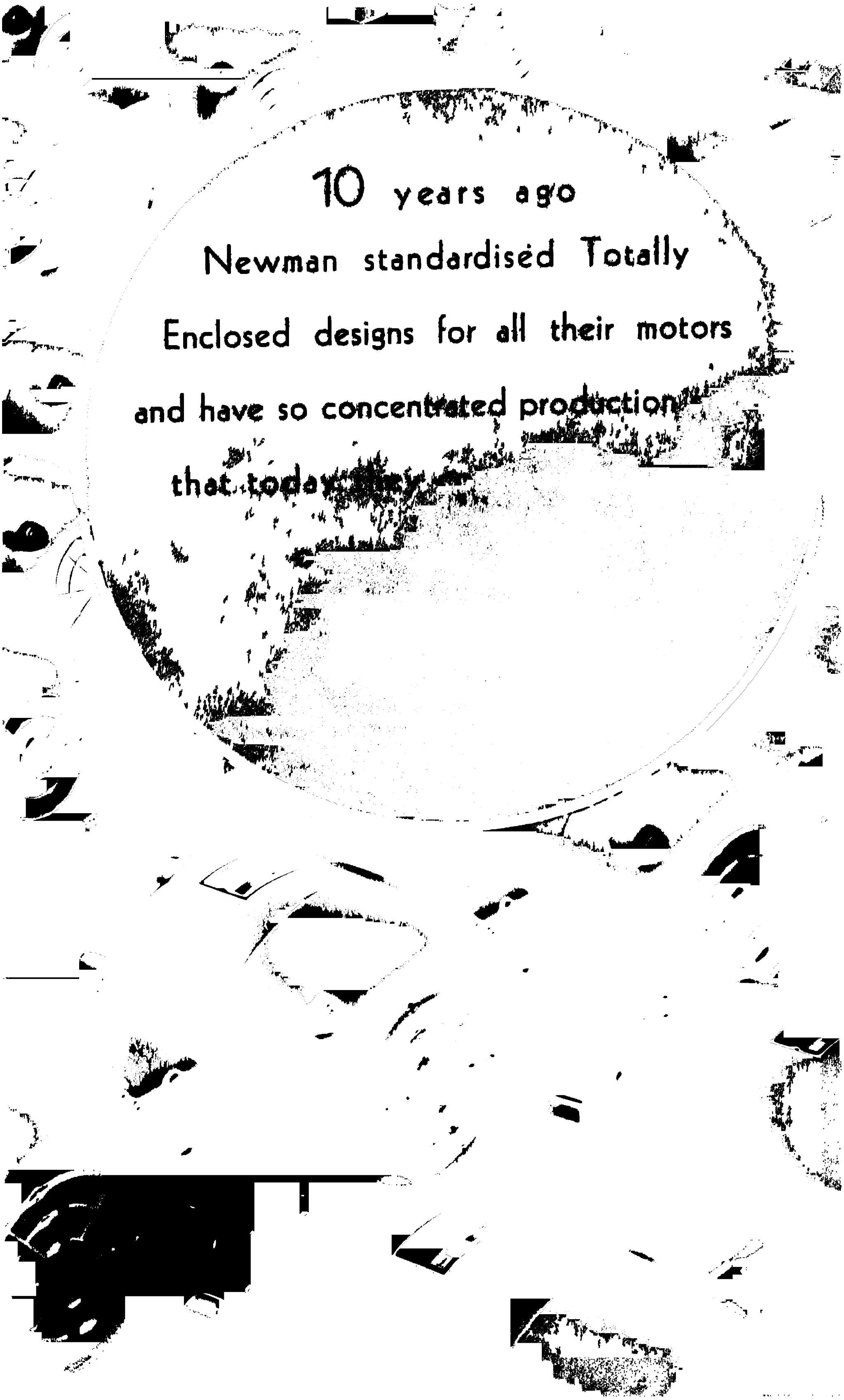
Last year this country consumed 316,395 tons of Zinc and 317,239 tons of Lead. At current values this represents about £53 millions of metal. Of these figures 93,183 tons represented secondary Zinc and 139,471 tons secondary lead.

Electrolytic grades of Zinc, used in engineering brass and similar high priority channels are in short supply. Die-casting has shown a big increase in consumption. We depend on the Western Hemisphere principally for our supplies, particularly the U.S. and Canada; Australia and Rhodesia furnish us with the balance.

We have more influence over supplies of Lead, 60% of which comes from Australia, Canada, Mexico and Peru provide us with the balance. British industry does not require a particularly high grade of concentrate, which is a helpful factor.

The dollar price of both metals seems unlikely to fall for some time. This is the dominant factor in settling the cost of Empire metal bought by the Ministry whose price remains static : Lead £90 p. ton ; Zinc £75 p. ton. Nickel £190-£195 p. ton. Tungsten Ore £6 8s.—£6 13s. per unit. Aluminium £80 p. ton.

On account of printing exigencies, Commodity prices and indices mentioned above were struck on a certain day during the month ; alteration in price movements since then must be allowed for.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PLASTICS

Strength of Plastics by W. S. Penn, B.Sc.

MANY statements have been made in the press that "Plastics are stronger than steel." Such irresponsible claims do much harm to the plastics industry which has been trying for a long time to counteract such undesirable publicity. In spite of the apparent frivolity, however, there must, of course, be some element of truth in the claims. It is the object of this article to clear the matter up so that it can be put in its correct perspective, and engineers can be given the facts on which to work.

Analysing the quotation mentioned above, it is found that there are two elements which require criticism. First of all the word "plastics" is very vague and, in fact, refers to a wide variety of materials. Many of these are certainly nowhere near the strength of steel on any basis whatsoever. The second criticism may be made against the unqualified statement "stronger than steel." In the case of certain plastics this is correct if the statement is qualified with the expression "weight for weight." With these two explanations it is possible to go on to a more exact description of the strength of plastics.

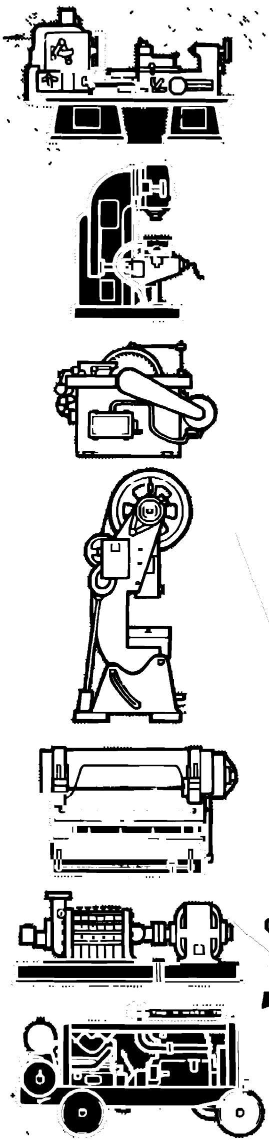
Thermoplastics.

For the purpose of discussing the strength of plastics they may be divided into the principal groups, thermoplastic and thermosetting plastics. Generally speaking the former are the least strong and are normally unsuitable for structural purposes. In addition to the lack of strength, they exhibit in varying degrees, according to the type, the phenomenon of cold flow. This again makes them unsuitable for structural purposes, except where no weight is involved. The following are a few strengths of plastics to illustrate the sort of thing which can be obtained. Polyvinyl chloride 2,000 to 4,000, polystyrene 5,000 to 7,000 and cellulose plastics about 6,000.

All the figures are in pounds per square inch. Actually, the figures quoted are not normally attained in most mouldings. The strength actually varies a great deal according to the amount of plasticiser, filler and so on which can be varied over wide limits.

A qualification must be made in the case of these thermoplastics. Many exist in two different physical forms. One is a moulding when, normally speaking, the molecules are disordered and the other is a fibre where the molecules are orientated. The figures already quoted refer to the disordered molecules because the orientation results in a considerable increase in strength. To quote figures, a cellulose fibre when first spun has a strength of 2 grams per denier. Stretching can take the strength up to between 6 and 8 grams per denier. The same applies to nylon, polythene, polyvinylidene chloride, polyurethanes and similar fibres. These strengths are greater than that of silk, which is about the strongest natural fibre.

We have now arrived at the point when we can compare the strength of steel and thermoplastics on a weight for weight basis. The strength of steel of course, varies a great deal but we will take it as between 30 and 40 tons per square inch. It will also be assumed that the density of steel is approximately 7.85 and in the case of plastics we will assume that the density on average for the thermoplastics is 1.4, although it is much less is some instances. The ratio of the two densities is approximately 5.6 so that we have to multiply the strength of the plastics by this figure to obtain weight for weight comparison of strength. In the case of a vinyl plastic, the strength is normally in the order of 2 tons per square inch so that the strength on a weight for weight basis compared with steel would be 11.2 tons. This is still far short of the strength of steel. Some of the thermoplastics, however, particularly polyvinylidene chloride have a greater initial tensile strength than p.v.c. A common figure is 4 tons per square inch, making the value compared with steel (in this article the comparison with steel will always be on a weight for weight basis) to be 22.4 tons, which is beginning to get close to the metal. Normally speaking, however, we cannot expect to obtain equivalent strength for the thermoplastics with steel even on a weight for weight basis. There is one theoretical exception to this. This is in the case of plastics which may be orientated. This applies to nylon, polyvinylidene chloride and, possibly, polythene. These are capable of developing strengths as high as 20 tons per square inch which would make the strength compared with steel to be 112 tons, which is far greater than steel. This comparison, however, is only



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theoretical. The huge strengths can only be developed in fibres of very small cross sectional area and it would not be possible to produce orientated mouldings of this strength which would theoretically be far superior to steel.

Thermosetting Plastics.

It is with the thermosetting plastics that the most fantastic claims have been made regarding strength in comparison with steel. Normally, thermosetting mouldings like radio cabinets, switches and the like are not particularly strong, however. For a normal wood flour filled moulding it is not likely that the strength will be more than 5 tons per square inch and frequently it will not be as high as this. A fabric filled phenolic might go as high as 6 tons per square inch but it is not likely that as a general rule this figure would be exceeded.

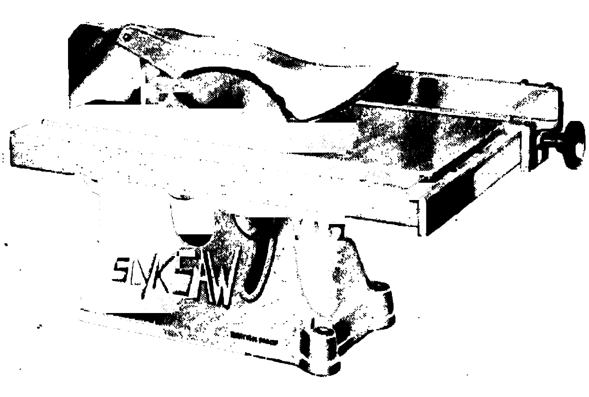
To be quite fair, in this weight for weight comparison we will take the s.g. of these plastics as being 1.5 and again steel 7.85. This makes the density ratio of the metal and plastic to be 5.2. With a maximum strength of 6 tons per square inch and a minimum strength of 4 tons per square inch for the plastics, this would make their strength compared with steel to be 31.2 and 20.8 tons respectively. This means that the mouldings are approaching the strength of steel.

Finally we arrive in this article at a consideration of laminated plastics. It is here where the greatest strengths are possible. The actual strength varies a great deal according the veneers which are employed. In the ca of paper laminates, for instance, the strengt varies between 3 and 8 tons per square inch in the case of cotton base fabrics, the strengt varies between 4 and 7 tons per square inch and in the case of glass fabric bases, th strength will vary between 7 and 10 or possibly, more tons per square inch. Compared with steel in each case, the maximum figures give strengths of 41.6, 36.4 and 52.0 tons respectively. Thus, these strengths are comparable with those of steel and are actually attainable in practice.

Conclusions.

It will have been seen from the above figures that on a weight for weight basis it is possible to obtain plastics as strong, if not stronger than steel. It should be considered, however, that this is at great inconvenience. On average, the cross sectional area of any section would have to be about 5 times as great as that of steel. This is an impossible state of affairs and, apart from the inconvenience of introducing such large sections into structures, the extra cost of the plastic would be prohibitive. Therefore, even though comparable strengths on a weight for weight basis are obtainable, it is virtually impossible to take advantage of these facts. The plastics must be employed at conventional thicknesses and their strengths at these thicknesses accepted.

A LITTLE while ago, we had occasion to examine a number of small power saws and were particularly impressed by the machine illustrated below. It is the "Slyksaw" made by J. & H. Smith, Ltd., of The Headrow, Leeds, 1, and is a small but powerful model of 2¾ in. capacity with many novel features for a saw of this type.



The guard is of a particularly ingenious design, being hinged to the base by means of a bracket so as to make it independent of the tilting table. The table, by the way, is fully tilting and is graduated for easy setting. The guard is so shaped as to ensure that the work will lift it as it is fed to the saw wheel, this ensures that the guard is always following the work and it falls down to cover the saw as the work passes away from the teeth.

The finish of the saw is also quite attractive, it is done in cream and blue enamel, bright steel and chromium. A special descriptive leaflet (No. 123) is available from the makers.

Continued from page 72

assumption that it decided to offer the maintenance team a set bonus figure of 30% at which to aim.

Alternatively, it may be preferred to "tie" the bonus figure to that earned by the process workers in which case it is suggested that the Average Bonus Factor of the process workers be substituted for the figure "30" and the maintenance bonus calculation made as before.

It will be generally agreed that maintenance, more than any other type of work, is subject to hidden lost time. On the other hand, it is a fundamental principle of any bonus scheme that payment can be made only for productive work in productive time. In this case the Plant Availability Factor constitutes the unit of measurement and, as a corollory, only productive time taken to maintain the plant, should be compared with the time allotted for its service.

However, workers are usually nervous about booking lost time and some foremen certainly do not help in the matter as they look upon such an entry on a Daily Time Sheet as a reflection on their supervision but the very nature of the work makes a certain amount of non-productive time an inherent contingency of the job itself and no disgrace should be attached to this fact. The salient point is to know what proportion of the total time booked was productive and non-productive; and to encourage workers to book it this way.

The Schedule of Maintenance Work indicated a team of 12 fitters and, carrying matters a stage further, it would be true to state that the work value—or "Standard"—of hours required per week is 480 (12×40).

This being so, the actual hours taken should be compared with the Standard Allotted Hours in computing the Gross Bonus Factor. It is agreed undesirable to encourage the skimping of work and, for this reason alone, no advantage should accrue to the team for taking less time than that allotted. On the other hand, a reasonable speed of working effort should be expected under bonus conditions and, if the time taken is greater than the time allotted the Gross Bonus Factor should be reduced as follows:—

$$\left\{\frac{(100 + \text{Gross Bonus Factor} \times \text{Allotted Hours}}{\text{Actual Hours}}\right\} - 100$$

Example.

Standard Allotted Hours $= 480$

Actual Hours Taken $= 500$

Gross Bonus Factor $= 21.4\%$

then reduced Bonus Factor is as follows:—

$$\left\{\frac{(121.4 \times 480}{500}\right\} - 100 = 16.54\% \text{ Bonus}$$

Supposing, however, that the 500 hours taken had included 20 hours of non-productive time. Had this been booked as such, the team would have kept within their allotted hours although only 96% of the time booked was productive.

In this case the team would have been paid a Nett Bonus Factor

$$\frac{21.4 \times 96}{100} = 20.54\%$$

It will be apparent that the use of the above formulae encourages the correct booking of working time.

While no attempt is made to lay down rigid principles or hard and fast rules, it is hoped that the facts presented will offer a new approach to an old problem.

A LETTER FROM OUR POST-BAG

To the Editor; *Mass Production.*

Sir,

The Government is rightly anxious for greater output by those industries whose products command a ready export market. In some cases, however, it has been suggested that insufficient attention has been paid to quality.

Would it not be possible to apply an export trade-mark to British industry? The product with which I am concerned, for example—namely Harris tweed—could provide a pointer for other industries. Some years ago the Board of Trade authorised the use by our industry of the well-known trade mark consisting of an orb surmounted by a Maltese Cross. This gave protection against imitations both to the Islanders of the Hebrides and to the public. Not only that—it compelled the industry to maintain a high standard, because only tweed reaching this standard may bear the trade mark.

Surely this principle could with profit be more widely adopted. Trade marks should be allocated to different industries, and only goods reaching prescribed standards should be permitted to carry the trade marks.

Yours faithfully,

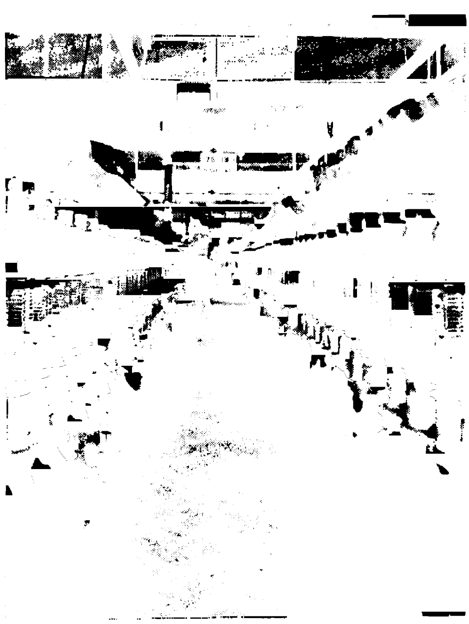
GEORGE ELLIS,

Chairman, Harris Tweed Association.

continued from page 47

element." Most notable of recent developments in viscose rayon are those relating to high tenacity yarns.

Originally, rayon was made in the form of continuous thread, whereas the production of staple in length did not get under way from the mass production aspect until 1930. Before the war immense quantities of staple fibre from the viscose process were made in Germany, Italy and Japan. Even then it was employed as a cotton substitute. During the Second World War, using a British discovery, tyre cords of viscose were made in quantity. The method of manufacture, known as the "Tenasco" process, from the high tenacity of the continuous yarn, is one of especial significance to the automobile industry. Where industrial vehicles carry heavy loads the running temperatures may be more than 100 degrees Centigrade. A curious physical characteristic of "Tenasco" yarn is that its strength greatly increases as the moisture content of the yarn decreases, such increase being nearly one-third as against a decrease in cotton cord of one-fifth. Viscose thread has thus established a new use for itself. A further advantage is that with these better wearing powers of rayon at high running temperatures it is possible to make tyres with thinner walls than when employing cotton, a saving of rubber, and resulting in a



Coning—One of the many processes by which yarn is put into a form suitable for weaving.

lighter tyre. In its turn the last means lower operating temperatures, with consequently less wear. Temperatures as much as 30 degrees Centigrade lower have been recorded. Transmission belting and belts for colliery conveyors are two other uses of this new high tenacity yarn. Insulation tape and fabric used in electrical insulations are other outlets for this interesting substance, which is a non-conductor. Viscose thread of an extensive range of size has been spun. Tyre cord of more than 2,000 denier has been produced commercially, while filaments of one-tenth the fineness of natural silk have been made.

22,000 people employed

Courtaulds began production of viscose rayon yarn in 1906 at Coventry. To-day, in 20 factories in the United Kingdom, more than 22,000 men and women are employed. Present production includes viscose rayon yarn and staple, acetate rayon yarn and staple, acetate film and plastics, all types of woven and knitted rayon fabrics, etc.

In 1909 the firm established the industry in the United States by founding the American Viscose Company, although most of this great investment of British capital had to be sold to American interests during the recent war to gain dollar credit for Britain.

In addition to its many factories in England and Wales this concern has its own dyeing works in three areas, and prepares its own chemicals at Trafford Park, Manchester, while at Accrington Courtaulds manufacture and service various types of their own textile machinery. The firm's capital is £32 million. The intended expansion programme is a highly important one, including a completely new rayon factory at Carrickfergus, Northern Ireland, where it is intended to instal plant for spinning viscose rayon yarn by a continuous process purchased from the Industrial Rayon Corporation of U.S.A. in 1945. The patents cover its use in practically every country outside the United States, excepting South America. It is believed that this process produces the best viscose yarn for almost all purposes. It is estimated that between 1,500 and 2,000 may be employed at this Ulster factory, whose construction has already begun. A new rayon staple factory at Easthaven, Dundee is also planned. Overseas it is intended to build a new rayon factory at Newcastle, Australia, and a new rayon staple unit at the Cornwall works of the firm's associate Canadian company, but actual fulfilment of these plans still depends upon the settlement of local and other problems.

PERSONALITIES

Mr. A. E. Sylvester and **Col. H. C. Smith** have accepted the invitation of the Minister of Fuel and Power to become Chairman and Deputy Chairman respectively of the Proposed Gas Council when the Gas Bill becomes law. The proposed salaries are Chairman £6,000 per annum and Deputy Chairman £5,000 per annum.

Mr. A. E. Sylvester

Col. H. C. Smith

Mr. H. A. L. Trew has been appointed Acting Press Officer of the Railway Executive (Western Region), Paddington Station.

Tube Investments announce the following appointments in the company's Light Alloy Division :—**Mr. W. H. Bowman, M.I.M.E., M.I.M.,** has been appointed Technical Director of the subsidiary companies, Reynolds Light Alloys Ltd., Reynolds Rolling Mills Ltd., and the South Wales Aluminium Company Ltd. **Mr. E. G. Snelus** has been appointed Sales Manager of Reynolds Light Alloys Ltd., and Reynolds Rolling Mills Ltd.

Major C. R. Dibben, O.B.E., who, since 1919, has been Midland Secretary of the F.B.I., is retiring from that office in order to devote more time to other industrial interests. His place as F.B.I. Midland Regional Secretary will be taken, on September 1, by **Mr. Ion Earle** who joined the F.B.I. in 1938 as Assistant to Major Dibben in the Federation's Birmingham Office.

In addition to the Courtaulds representatives, **Sir Edward Appleby,** secretary of the Department of Scientific and Industrial Research and winner of the Nobel Prize in Physics, and **Sir Charles Tennyson,** Dunlop's secretary, have been appointed trustees of the Courtaulds' Scientific and Educational Trust Fund which has just been formed to encourage study and research in those branches of natural science likely to assist the textile, plastics or allied industries.

OBITUARY

The death occurred at his home in Seaford, Sussex, at the age of 67 of **Mr. H. A. Dormer, M.I.Mech.E.** Chairman of The Sheffield Twist Drill and Steel Company Limited.

Mr. Dormer served his apprenticeship with Mirrlees Watson & Co. Ltd., and became Assistant Works Manager.

He then joined as partner the firm of consulting engineers, Engineering Supplies Ltd., and was instrumental with his partner the late Mr. Leslie Robertson in introducing the Schmidt Superheater into Great Britain. This Superheater became standard equipment on all locomotives in this country.

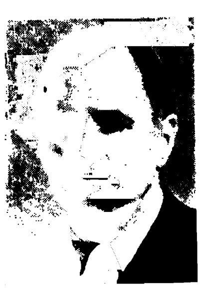
Later he became Joint Managing Director with the late **Mr. C. W. Claxton** of The Sheffield Twist Drill and Steel Company Ltd., and together they built the Company up to its present eminent position.

Mr. Dormer will be mourned by a large circle of friends especially those in the Engineering and Masonic Worlds and in the City of London.

Hopkinson Electric Company Ltd. advise us that **Mr. E. C. Moxon** of 115 Warwick Road, Birmingham 27, their Sales Engineer for the Midland Area, is now on the telephone. His number is Acocks Green 2986.

Mr. F. E. Weaver, A.M.I.Ex. founder and for some time manager of the E. H. Jones (Machine Tools) Ltd., Export Division is leaving the Company to return to the Dominions. **Mr. H. W. Earthrowl, M.I.Ex.,** will take over his duties as Export Manager.

We hear, from A. C. Wickman Ltd. that their Export Sales Director, **Mr. J. W. Buchanan** and the Machine Tools Sales Manager, **Mr. S. W. Perkins** are in the U.S.A. They have been staying there for a few weeks, to contact Wickman principals for the purpose of discussing the English market and its impact on the design of American machine tools for this country.



Mr. J. W. Buchanan

Mr. S. W. Perkins

The British Aluminium Co., Ltd. announce the following appointments in the sales division: **Mr. H. H. Cundell** has been appointed Sales Manager, responsible for Sales Department. **Mr. A. W. Langham** who temporarily undertook responsibility for Sales and Sales Planning Departments, following the appointment of Mr. E. A. Langham to India last year, will continue to be responsible for Sales Planning Department, with the title of Sales Planning Manager as before. **Mr. E. E. Spillett** has been appointed Development Manager in place of Mr. Cundell. **Mr. P. S. W. Swabey** has been appointed Assistant Development Manager in place of Mr. Spillett.

Richard C. Cullen, A.M.I.I.A. has moved from London to 25a Gedling Grove, Nottingham where he has set up business as an industrial consultant specialising in factory re-organisation. We hear that Mr. Cullen has recently been elected a Member of the Institute of Economic Engineering.

Mr. Donald Hawkins, general sales manager of the Dunlop Sports Company, has been appointed Director of Production of Dunlop Malayan Estates Ltd. He was with Dunlop in Malaya until the Japanese invasion and then joined the tyre division in England, transferring later to the Sports Company. Mr. Hawkins left for Singapore a few days ago.

Mr. Donald Hawkins

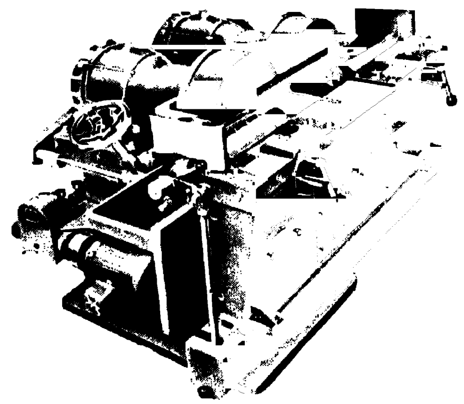
A NEW KNIFE GRINDING MACHINE

We recently had an opportunity of examining a new type of knife grinding machine that is a distinct improvement on any machine previously marketed. We refer to the W.A.D. machine made by Walters and Dobson Ltd., of Sheffield, and illustrated on this page.

Each Grinding Head is provided with a 5 h.p. Motor and a $1\frac{3}{4}$ h.p. Motor drives the traverse independently. The carriage accommodates two Blade Holders—one at each end thus making it convenient for the operator. The machine is continuous in operation, sufficient time being allowed only, for removal of ground blade and replacement of new blank.

The machine is provided with an oscillating device to obviate "sucking," or drawing the temper of the blade due to excessive local heating. The oscillations permit free entry of the coolant at the point of contact between the stone and the blade. For illustrative purposes stone guard is not shown. This is of steel construction and is easily removed for purposes of examination or stone replacement.

The new machine can accommodate blades up to 11 in. maximum length and is capable of dealing with a throughput of 168 blades per hour. It is 54 in. high, 64 in. long and 56 in. wide.



Continued from pages 66-68

Two types of the mill are being made. The larger will produce electric welded tubes of $\frac{3}{4}$-inch to 4 inches diameter, with wall thicknesses of .104 inch to .036 inch dependent upon diameter. In sections the maximum developed width is 12 inches, with thicknesses of .128 inch to .028 inch. Speed of production of welded tube is from 40 to 100 feet per minute, and of sections from 40 to 150 feet per minute. Drive is by a 20 h.p. electric motor through triplex chain.

The general method of making tubes is that of drawing a solid billet of metal through dies until the required diameter is attained. This may mean at least a dozen separate processes, and can only be done when the metal is heated and malleable, which needs repeated annealing and re-annealing. In addition, a fairly large supply of labour is necessary. As compared with this, the new mill bends steel strip by a series of rollers into cylindrical form, then welds them by a mercury bath welding head water-cooled internally, which obviates the use of brushes and gives a local heat application of 75 per cent, electrical efficiency.

Present rate of production is 8 mills per annum, and orders have been received from the United States, South Africa, Belgium, Canada and Argentine.

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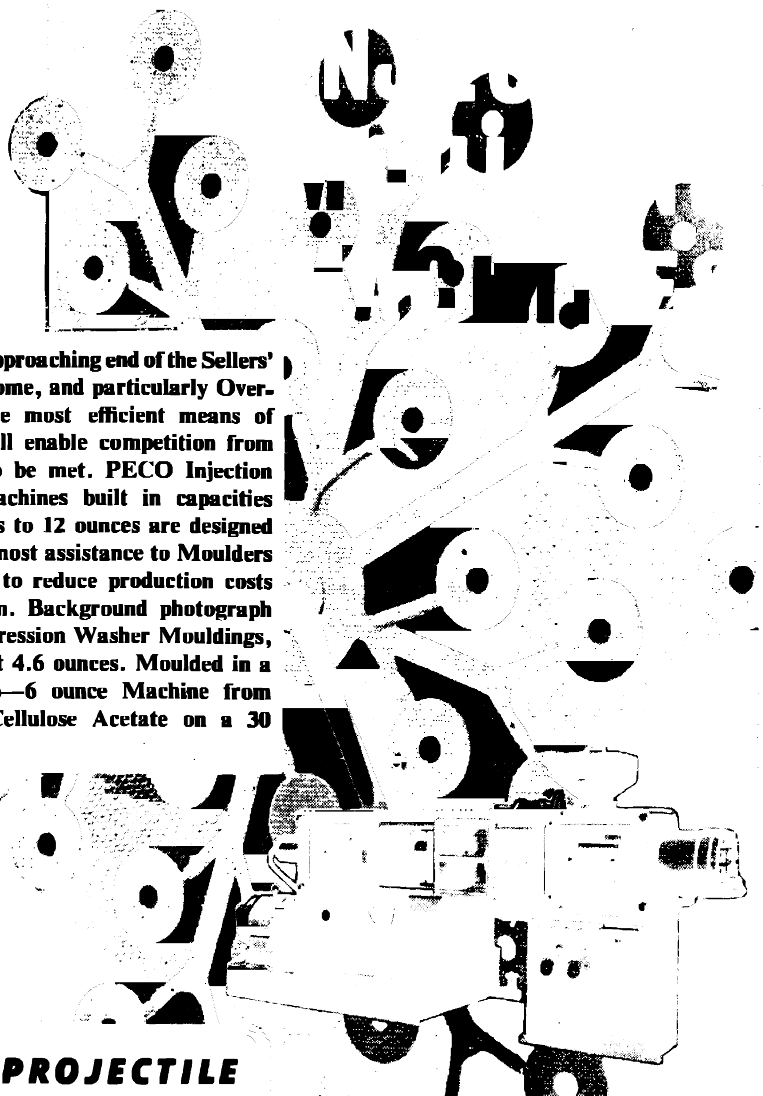


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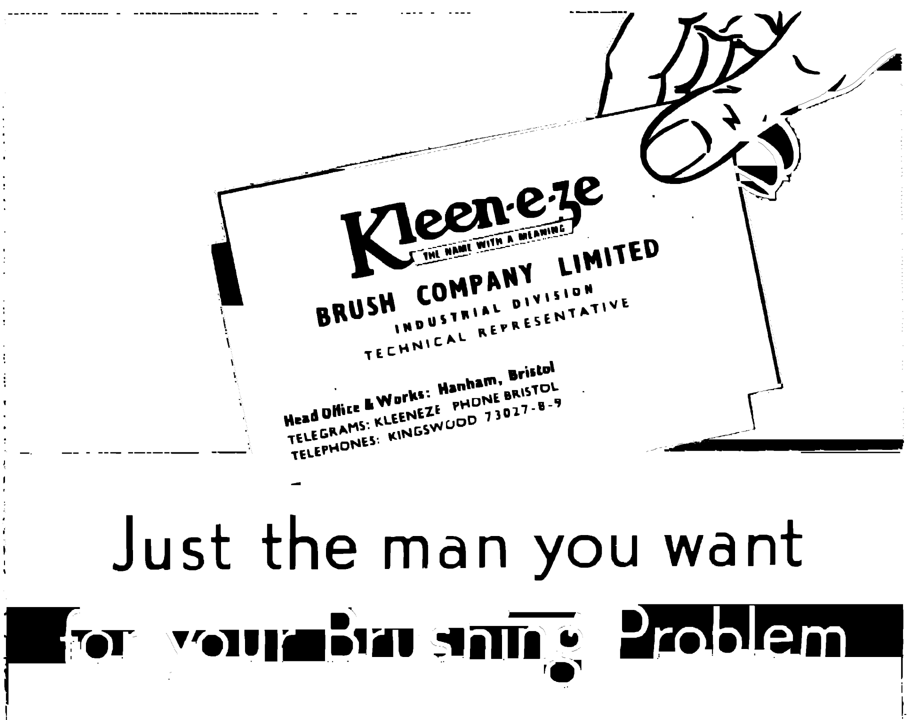
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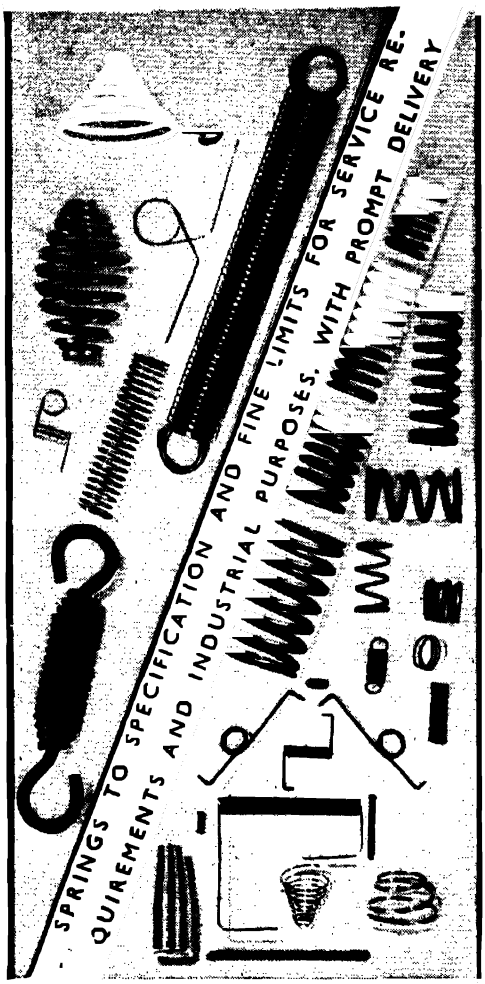

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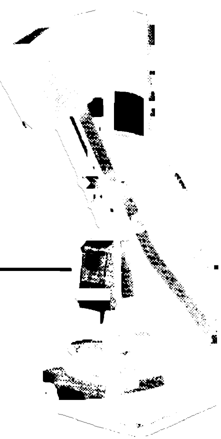

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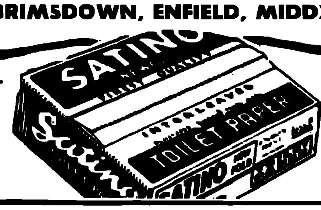
Super 

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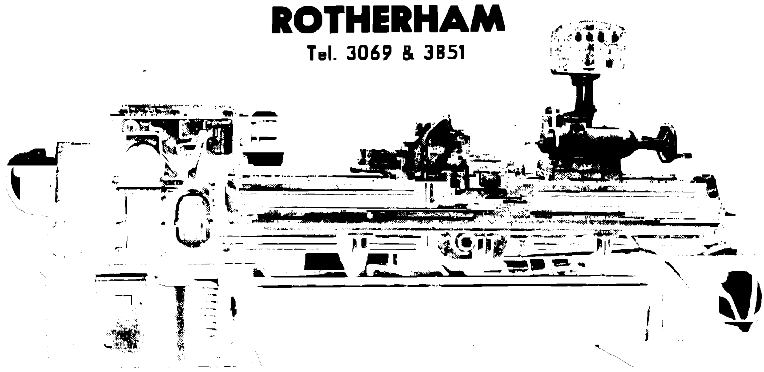

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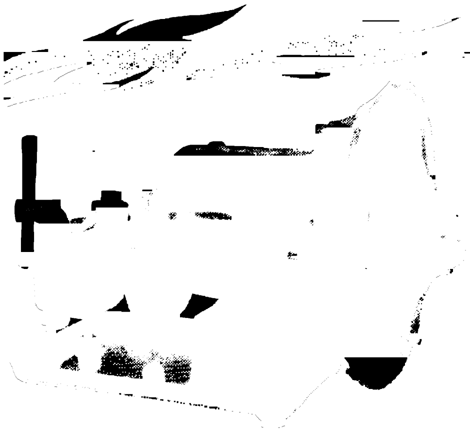

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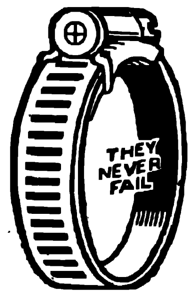

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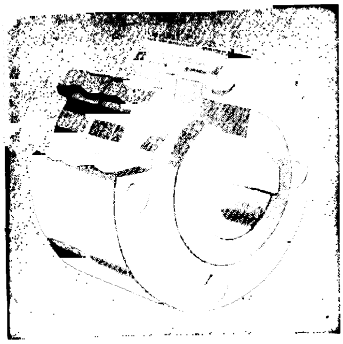

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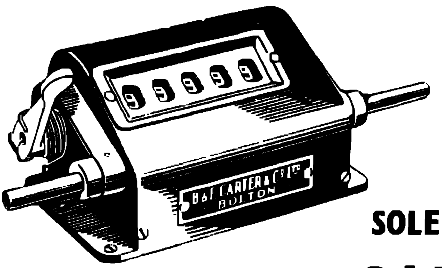

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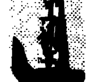

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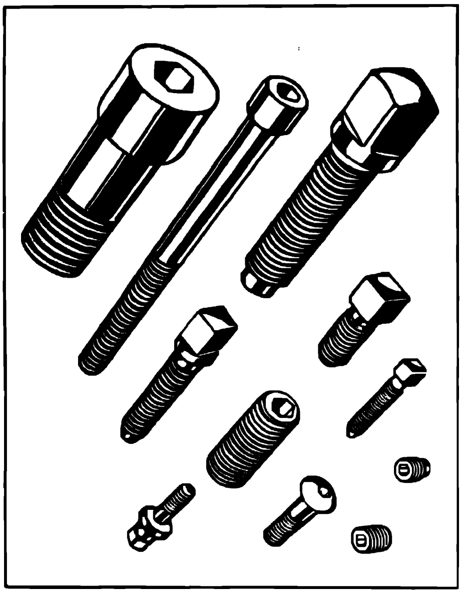

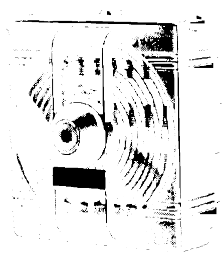

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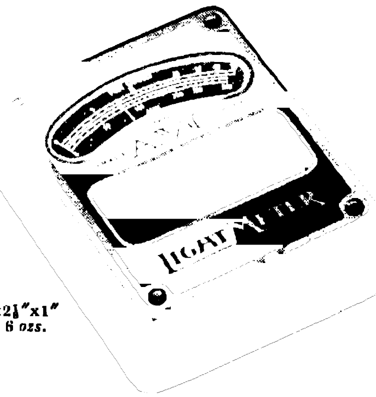

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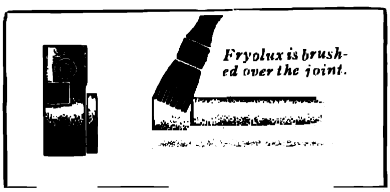
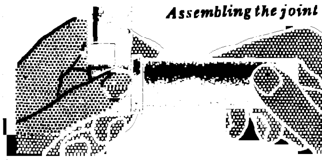
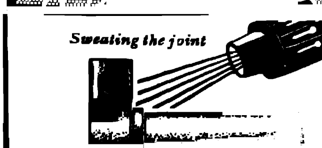
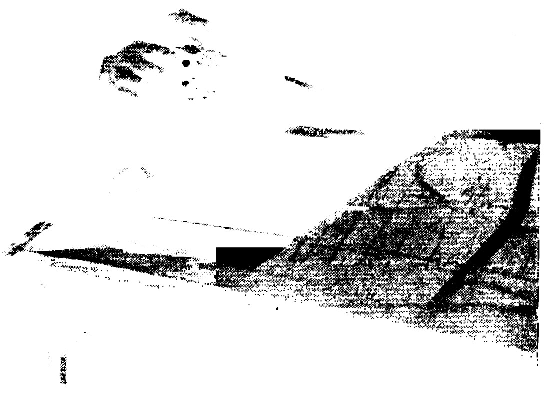

Fryolux is brushed over the joint.


Assembling the joint


Sweating the joint



Above. *Local tinning of brass sheet prior to fabrication, using FRYOLUX. By courtesy of Messrs. Serck Radiators Ltd.*

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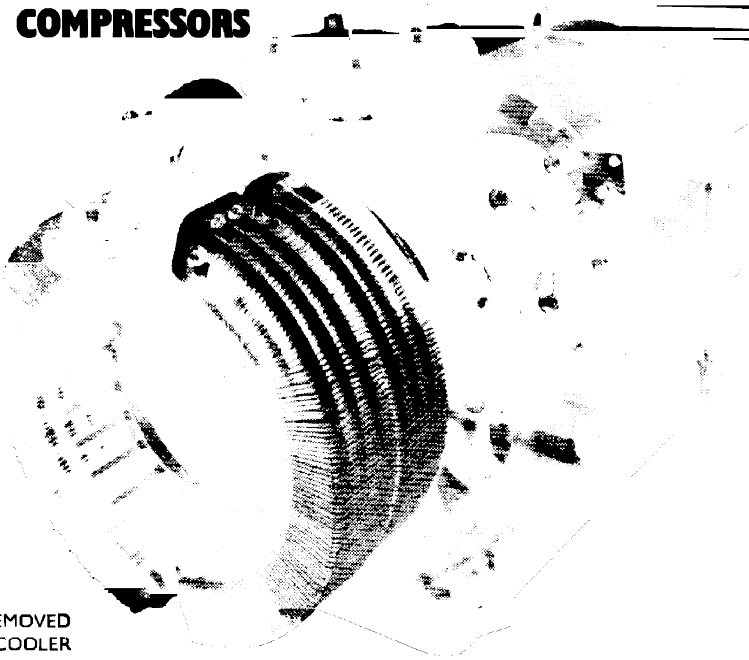

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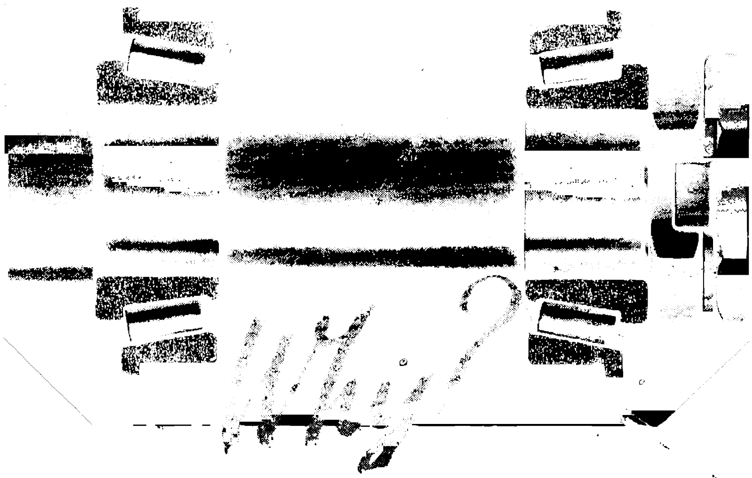

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